

**Marine Area 10  
Mark-Selective Recreational Chinook Fishery,  
December 1, 2007 – January 31, 2008**

**Post-season Report**

**REVISED DRAFT**

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**TABLE OF CONTENTS**

TABLE OF CONTENTS..... 2

LIST OF TABLES..... 4

LIST OF FIGURES ..... 5

EXECUTIVE SUMMARY ..... 6

INTRODUCTION ..... 8

METHODS ..... 9

**Marine Catch Area Description** ..... 9

**Monitoring Program Overview**..... 9

**Catch and Effort: Sampling and Estimation** ..... 11

**Test Fishery Methods** ..... 13

**Estimating Fishery Impacts**..... 14

        Total Encounters and Mortalities..... 14

        CWT Impacts..... 15

RESULTS & DISCUSSION..... 16

**Summary of Sampling Efforts**..... 16

        Sampled Access Sites ..... 16

        Boat Survey Summary ..... 16

**Fishery Characteristics** ..... 17

        Estimates of Fishing Effort and Catch ..... 17

        Trends in Angling Effort, CPUE, and Total Chinook Encounters ..... 18

        Characteristics of Harvested Chinook ..... 20

        CWT Samples ..... 21

**Test Fishing Results**..... 22

        Gear Types and Fishing Time..... 22

        Chinook Encounters and Mark Rates ..... 23

        Chinook Size and Age ..... 25

        Other Fish Species Encountered ..... 26

**Overall Fishery Impacts**..... 26

        Total Encounters and Mortalities..... 26

        FRAM versus Creel Comparison..... 27

        Estimated CWT-DIT Impacts..... 29

ACKNOWLEDGEMENTS ..... 30

REFERENCES ..... 31

APPENDICES ..... 32

**Appendix A.** Mark-selective fishery impact estimation details..... 33

**Appendix B1.** 2007 statistical weeks used by Washington Department of Fish and Wildlife. .... 40

**Appendix B2.** 2008 statistical weeks used by Washington Department of Fish and Wildlife. .... 41

**Appendix C.** Monthly sample rates in the Area 10 (December 1, 2007 - January 31, 2008) selective Chinook fishery. .... 42

**Appendix D.** Murthy estimates of effort, retained catch, and releases in the Area 10 winter selective Chinook fishery, December 1, 2007 – January 31, 2008..... 43

**Appendix E.** Summary of the total number of anglers intercepted in Area 10 during on-the-water surveys from December 1, 2007 through January 31, 2008. Grayed cells represent sites included in the dockside sample frame. .... 44

**Appendix F.** Size measures by sample date, for sites sampled during dockside creel surveys in the Area 10 mark-selective Chinook from December 1, 2007 through January 31, 2008. .... 45

**Appendix G.** Age composition of retained (dockside samples) and encountered (test fishery samples) Chinook salmon in the Area 10 mark-selective Chinook fishery, December 1, 2007 - January 31, 2008. Note that two test fishery Chinook of undetermined mark status were also aged (i.e., total n = 116). .... 46

**Appendix H.** Coded-wire tag recoveries from Chinook salmon landed during the Area 10 winter 2007- 2008 mark-selective Chinook fishery from December 1, 2007 through January 31, 2008..... 47

**LIST OF TABLES**

**Table 1.** Sampling/estimation details on target parameters associated with the overall Areas 8-1 and 8-2 mark-selective fishery monitoring program (**Figure 1**)..... 15

**Table 2.** List of sites sampled during the Area 10 selective Chinook fishery..... 16

**Table 3.** Monthly summary of boat surveys conducted during the Area 10 selective fishery, December 1, 2007 through January 31, 2008..... 17

**Table 4.** Estimates of total fishing effort and the total number of salmon kept and released during the December 1, 2007 to January 31, 2008 Area 10 selective fishery. Values may not add exactly due to rounding error..... 17

**Table 5.** Summary of length samples collected during dockside angler interviews from retained Chinook salmon in the Area 10 selective Chinook fishery, December 1, 2007 – January 31, 2008..... 20

**Table 6.** Summary of coded-wire tags recovered from Chinook salmon harvested during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery. The “No. DITs” field corresponds to the number of tags that belonged to double-index tag groups..... 22

**Table 7.** Fishing methods employed by private recreational anglers (from dockside interviews, based on number of boat trips sampled,  $n = 166$ ) and test fishers (based on hours fished,  $n = 95.9$ ) during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery..... 23

**Table 8.** Composition of test fishery Chinook encounters and associated mark-rate and size/mark-status proportion estimates (SE = standard error) for the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery..... 24

**Table 9.** Total Chinook encountered (retained and released) by private (non-charter) boat anglers reporting their catch on voluntary trip reports (VTRs) during the Area 10 mark-selective Chinook fishery (December 1, 2007 through January 31, 2008), with estimates of legal-size, sublegal-size, and overall mark rates..... 24

**Table 10.** Test fishery catches of species other than Chinook salmon during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery..... 26

**Table 11.** Summary of season-wide fishery impact estimates for the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery. Values may not add up perfectly due to rounding error..... 27

**Table 12.** Comparison of modeled (i.e., using FRAM, model run 3907) and estimated total Chinook encounters for the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery..... 27

**Table 13.** Comparison of modeled (i.e., using FRAM, model run 3907) and estimated total Chinook mortalities for the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery..... 29

**Table 14.** Summary of double-index tagged (DIT) Chinook kept by anglers, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery..... 29

## LIST OF FIGURES

**Figure 1.** Map of Marine Catch Area 10 in Puget Sound, where the first season of the pilot winter selective Chinook fishery occurred from December 1, 2007 through January 31, 2008. Circled numbers correspond to special fishing/harvest regulations present during the Area 10 selective fishery..... 10

**Figure 2.** Conceptual diagram of the monitoring plan implemented in Area 10 during its December 1, 2007 to January 31, 2008 mark-selective Chinook season. Circles represent discrete sampling activities, dashed boxes represent parameters that are estimated using data from a given activity, and solid boxes depict key quantities estimated from the comprehensive plan. ‘Encounters’ includes both harvested and released Chinook salmon. .... 13

**Figure 3.** Temporal patterns in fishing effort during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery. See the WDFW statistical week calendar in **Appendices B1** and **B2** for day and month equivalents to plotted statistical weeks. .... 18

**Figure 4.** Temporal patterns in CPUE (landed Chinook per angler or boat trip) during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery. See the WDFW statistical week calendar in **Appendices B1** and **B2** for day and month equivalents to plotted statistical weeks..... 19

**Figure 5.** Temporal patterns in total Chinook harvest and releases during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery. See the WDFW statistical week calendar in **Appendices B1** and **B2** for day and month equivalents to plotted statistical weeks. .... 20

**Figure 6.** Length-frequency distribution of retained marked Chinook sampled at dockside during the Area 10 mark-selective Chinook fishery, December 1, 2007 – January 31, 2008. .... 21

**Figure 7.** Length-frequency distributions of marked (left panel) and unmarked (right panel) Chinook encountered by test fishers during the Area 10 December 1-January 31, 2008 mark-selective Chinook fishery. The dashed vertical line in the marked Chinook plot corresponds to the legal size limit (22 in or 56 cm). .... 25

**Figure 8.** Monthly mean total length (+/- 95% CIs) of Chinook sampled by test fishers during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery, by brood year. .... 25

**Figure 9.** Comparison of modeled (i.e., using FRAM, model run 3907) and estimated total Chinook encounters and mortalities for the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery. Error bars represent approximate 95% confidence intervals for field estimates. 28

## EXECUTIVE SUMMARY

The Washington Department of Fish and Wildlife (WDFW) implemented a winter mark-selective Chinook fishery (MSF) in Marine Area 10 for the first time, from December 1, 2007 through January 31, 2008. Consistent with the 2004 Puget Sound Chinook Harvest Management Plan (Puget Sound Indian Tribes and WDFW 2004) and the intent of previous Puget Sound/Strait of Juan de Fuca mark-selective Chinook fisheries, the primary goal for this pilot fishery was to provide meaningful opportunity to the recreational angling public while minimally impacting ESA-listed Puget Sound Chinook salmon. WDFW's Puget Sound Sampling Unit (PSSU) implemented an intensive monitoring program in Area 10 throughout the fishery in order to collect the data needed to estimate key parameters characterizing the fishery and its impacts on wild salmon. Sampling activities included dockside creel sampling, test fishing, and on-the-water effort surveys. Among other parameters, efforts emphasized data collection needs for the estimation of: *i*) the mark rate of the targeted Chinook population, *ii*) the total number of Chinook salmon harvested (by size [legal or sublegal] and mark-status [marked or unmarked] group), *iii*) the total number of Chinook salmon released (by size and mark-status group), *iv*) the coded-wire tag- (CWT) and/or DNA-based stock composition of marked and unmarked Chinook mortalities<sup>1</sup>, and *v*) the total mortality of marked and unmarked double index tag (DIT) CWT stocks.

Creel samplers staffed a total of five different access sites on 41 of the 61 days that Area 10 was open under mark-selective harvest regulations. Samplers interviewed an estimated 20% of all participating anglers ( $n = 523$  angler trips) and sampled 22% of all marked Chinook harvested ( $n = 140$ ). Additionally, PSSU staff conducted six angler effort surveys (boat), and spent 21 days (96 hours) on the water pursuing Chinook using test fishing methods, in support of Area 10 monitoring efforts. Based on these efforts, we estimated that 2,544 angler trips were completed by a combination of private fleet and charter anglers during the fishery. With a CPUE of 0.25 Chinook landed per angler trip, these anglers harvested a grand total of 635 marked and 21 unmarked Chinook; they released an estimated 2,464 Chinook (1,940 marked and 524 unmarked). Harvested Chinook averaged 59 cm (range: 53 to 80 cm) in total length and were larger than the legal minimum size limit ( $\geq 22$  in or 56 cm TL) in most instances (dockside marked Chinook observations, 116 legal /137 total or 85%). Most of the Chinook harvested were of brood year 2005 origin (i.e., age 2 fish in Dec. or age 3 fish in Jan.). In addition, 12 CWTs were recovered from harvested fish, all of which were from Puget Sound and Hood Canal release sites.

During their two months of sampling in Area 10, test fishers encountered 120 Chinook salmon, 26% and 66% of which were of legal size and marked, respectively. With a "CPUE" of 1.14 (LM Chinook encounters / angler trip), test fishers experienced a similar legal-marked Chinook encounter rate as did charter anglers. Chinook encountered by test fishers averaged 52.6 cm (range: 29 to 79 cm) in total length and were predominantly 2 and 3 years in age (98% of marked and 90% of unmarked totals). We estimated the overall mark rate at 83% (77% for legal-size Chinook only) and size/mark-status composition at 20.0% legal-marked, 5.8% legal-unmarked, 62.5% sublegal-marked, and 11.7% sublegal-unmarked.

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<sup>1</sup> Though the necessary tissue samples have been collected, DNA-based estimates of stock composition are presently unavailable for Puget Sound/Strait of Juan de Fuca mark-selective fisheries. In the present report, CWT-based (unexpanded) estimates of the stock composition of marked Chinook harvest are provided.

By combining dockside sampling results (i.e., legal-marked Chinook harvest estimates), test fishery/VTR size/mark-status composition data, and charter census results, we generated size/mark-status group-specific estimates of encounters and mortalities. In total, 3,120 Chinook were encountered (retained and released) during the Area 10 fishery, with 619 of these being legal-marked, 184 legal-unmarked, 1,956 sublegal-marked, and 361 sublegal-unmarked individuals. Among released encounters, an estimated 12 legal-marked, 24 legal-unmarked, 372 sublegal-marked, and 72 sublegal-unmarked Chinook (481 overall) were estimated to have died due to handling and release effects. Thus, in total, 1,019 marked (62% due to direct harvest) and 117 unmarked Chinook mortalities occurred as a result of the Area 10 fishery. All Chinook impacts were less than expectations set by pre-season Fishery Regulation Assessment Model runs (model run 3907). The impact of the Area 10 fishery on unmarked Chinook was lower than half of what was anticipated. Finally, regarding impacts of MSFs on the coded-wire tag (CWT) program, we estimated that 3 unmarked Chinook belonging to double-index tag (DIT) groups may have died due to the handling-and-release impacts of the pilot Area10 fishery.

## INTRODUCTION

In recent years, abundant runs of hatchery Chinook salmon (*Oncorhynchus tshawytscha*) have mixed with depressed runs of wild Chinook salmon in the marine environments of the Puget Sound and Strait of Juan de Fuca. Providing recreational anglers with opportunities to harvest abundant hatchery stocks while simultaneously protecting weaker, wild stocks has proven to be a significant conservation and management challenge. The combination of large-scale hatchery marking (i.e., fin clipping) programs and mark-selective harvest regulations makes it possible for anglers to pursue and harvest hatchery Chinook salmon while minimally impacting wild salmon populations. In such “mark-selective fisheries” (MSFs), anglers are generally allowed to retain adipose-fin clipped (“marked”) hatchery fish and are required to release unharmed any unclipped (“unmarked”, predominantly wild) salmon encountered<sup>2</sup>.

Since the first marine selective Chinook fishery occurred in Marine Catch Areas 5 and 6 (Strait of Juan de Fuca) in 2003 (WDFW 2008a), mark-selective Chinook salmon fishing regulations have been implemented on a pilot basis in multiple Puget Sound Marine Catch Areas during both summer and winter seasons. As of the close of the 2006-07 fishing season, pilot *summer* selective Chinook seasons have occurred in Areas 5 and 6 for five years (2003-2007; WDFW 2008a) and in Areas 9, 10, 11, and 13 for one year (2007; WDFW 2007a and 2007b); pilot *winter* selective Chinook fisheries have occurred in Areas 8-1 and 8-2 for two complete seasons (2005-06 and 2006-07; WDFW 2008b). From December 1, 2007 through January 31, 2008, the Washington Department of Fish and Wildlife (WDFW) implemented the first winter mark-selective Chinook fishery in Area 10 during the winter season. Consistent with the 2004 Puget Sound Chinook Harvest Management Plan (Puget Sound Indian Tribes and WDFW 2004) and the intent of previous mark selective Chinook fisheries, the primary goal for this pilot fishery was to provide meaningful opportunity to the recreational angling public while minimally impacting ESA-listed Puget Sound Chinook salmon.

Given the pilot nature of the Area 10 winter selective Chinook fishery, WDFW’s Puget Sound Sampling Unit was tasked with implementing an intensive monitoring program during the entirety of its December 1, 2007 to January 31, 2008 season. Our primary goal was to collect the data needed to estimate key parameters characterizing the impacts of this fishery on wild salmon. As per State–Tribal agreement (WDFW and NWIFC 2007), we tailored our sampling so that we could reliably estimate: *i*) the mark rate of the targeted Chinook population, *ii*) the total number of Chinook salmon harvested (by size [legal or sublegal] and mark-status [marked or unmarked] group), *iii*) the total number of Chinook salmon released (by size and mark-status group), *iv*) the coded-wire tag- (CWT) and/or DNA-based stock composition of marked and unmarked Chinook mortalities<sup>3</sup>, and *v*) the total mortality of marked and unmarked double index tag (DIT) CWT stocks. In addition, we acquired and analyzed relevant data

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<sup>2</sup>The regulations specific to the 2008 Area 10 mark-selective fishery allowed for the retention of up to two legal-sized ( $\geq 22$  inches [56 cm]) marked Chinook salmon per day and required the immediate release of all unmarked or sublegal Chinook. Additionally, anglers were: *i*) required to use single-point, barbless hooks while fishing for salmon, *ii*) held to a combined (all salmon species) two-fish daily limit during the Area 10 mark-selective fishery, and *iii*) held to a handling rule that prevented them from bringing unmarked and/or sublegal Chinook aboard their vessels.

<sup>3</sup> Though the necessary tissue samples have been collected, DNA-based estimates of stock composition are presently unavailable for Puget Sound/Strait of Juan de Fuca mark-selective fisheries. In the present report, CWT-based (unexpanded) estimates of the stock composition of marked Chinook harvest are provided.

characterizing other aspects of the pilot fishery, including descriptors of fishing effort, fishing success (catch [landed Chinook] per unit effort), the length and age composition of encountered Chinook, and the overall intensity of our sampling efforts.

In the following pages, we report the results generated through our Area 10 monitoring activities. We first provide a brief review of our in-season sampling and post-season assessment methods and then present detailed results for each component of our selective-fishery monitoring program. Results are presented according to the following sequence: *i*) the intensity (i.e., spatial and temporal coverage) of sampling efforts is described; *ii*) estimates of fishery characteristics obtained from creel survey data are reviewed; *iii*) the results from our recreational test fishery are presented; and *iv*) total fishery impacts—estimated based on the combination of creel and test fishery data—are reviewed and compared with pre-season expectations (i.e., based on Fishery Regulation Assessment Model [FRAM] predictions). Finally, we provide a detailed description of our impact estimation scheme as well as additional and relevant data in a series of appendices (i.e., sample-rate tables and sampling summaries; age composition tables [for landed catch and test fishery encounters]; and raw CWT recoveries).

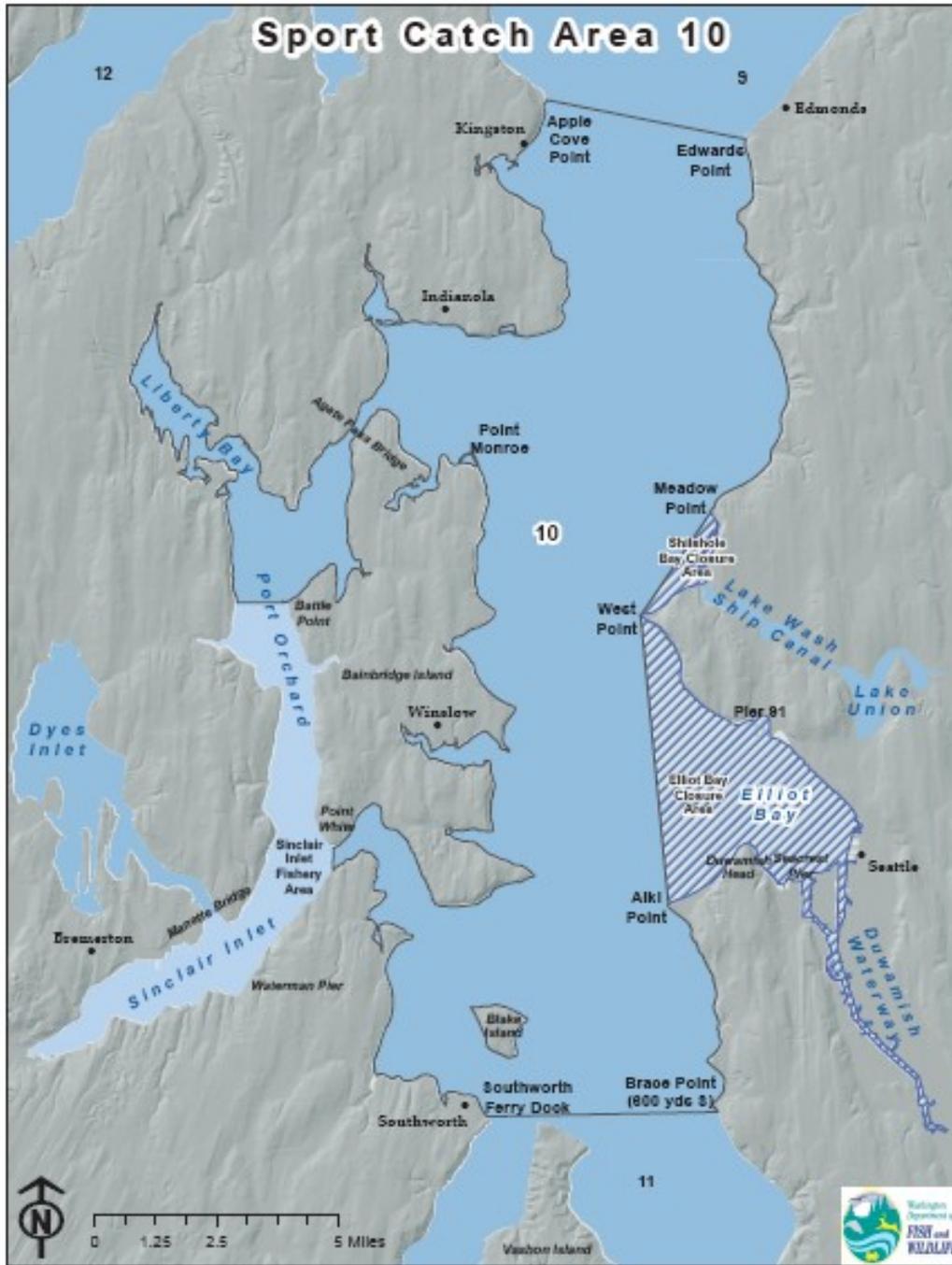
## METHODS

### Marine Catch Area Description

Marine Catch Area 10 encompasses the waters around the largest population center in the Puget Sound Region. Encompassing 100-200 mi<sup>2</sup> (206-512 km<sup>2</sup>) of marine water, Area 10 extends from the Apple Cove Point – Edwards Point line south to a projected east-west line through the north tip of Vashon Island (**Figure 1**).

### Monitoring Program Overview

Our sampling program for the Area 10 fishery incorporated comprehensive and complementary data collection strategies, including dockside angler interviews (with catch sampling), on-the-water (instantaneous) effort surveys, test-fishery-based sampling, and voluntary reports of completed trips provided by charter boats and private anglers (**Figure 2**). Although we provide a brief review of the field and analytical methods associated with our sampling efforts here, we refer the reader to WDFW (2007b or 2008b) for additional detail.



**Figure 1.** Map of Marine Catch Area 10 in Puget Sound, where the first season of the pilot winter selective Chinook fishery occurred from December 1, 2007 through January 31, 2008. Circled numbers correspond to special fishing/harvest regulations present during the Area 10 selective fishery.

## Catch and Effort: Sampling and Estimation

We collected data on total catch (observed harvest and reported releases<sup>4</sup>) and total angling effort using a two-stage stratified cluster sample design. At the first stage, we selected five sample days from two temporal strata (weekday [Monday-Thursday], with  $n = 2$  days sampled; weekend [Friday-Sunday], with  $n = 3$  days sampled) during each week of the fishery. On each selected sample day, we selected two access points (i.e., public ramps, boathouses, etc.) from our Area 10 sample frame for creel sampling. Access site (i.e., cluster) selection was achieved at the second stage using a probability-proportional-to-size (PPS) sampling algorithm (the Yates-Grundy or “natural” method, Cochran 1977). The measure of size used in PPS sampling was equivalent to the fraction of total sample-frame effort attributed to a given site; this quantity was estimated using data collected during instantaneous on-the-water surveys (i.e., “boat surveys”) conducted routinely during the course of the fishery. Our sample frame included all moderate-to-high effort, public boat launch facilities that are used to access Area 10, including: Armeni Ramp, Shilshole Public Ramp, Kingston Public Ramp, Manchester Public Ramp, and Edmonds Marina Dry Storage. Given that some effort was excluded from our sample frame (i.e., private and/or low-effort access sites), we also estimated the out-of-frame effort proportion from boat survey data and accounted for this quantity in estimates of fishery-wide totals (e.g., catch and effort).

At access sites selected for sampling on scheduled sample days, samplers interviewed *all* anglers exiting the Area 10 fishery. During interviews, samplers acquired data on trip duration, trip intent (i.e., targeted species), fishing method(s) employed (downrigger or diver trolling, jigging, mooching, or other), and fish encountered (kept and/or released, by species). When an interviewed party possessed Chinook or coho salmon, samplers inspected them for CWTs using wand detectors, and collected snouts from CWT positive individuals for later lab processing. Additionally, samplers took length measurements (fork and total) and scale samples from landed Chinook.

By combining dockside interview data with estimates of size measures, we generated daily estimates (and variances) of total fishing effort and landed Chinook catch (by mark-status group) for our sample frame using Murthy’s population-total estimator (Murthy 1957, Cochran 1977, WDFW 2008b). We then expanded these estimates to account for the out-of-frame effort proportion and then again to obtain stratum totals (**Table 1**). To minimize the influence of recall bias on our assessment, we estimated Chinook releases as the difference between retained catch (i.e., from the Murthy estimator, based on *observed* landings) and total Chinook encounters (i.e., releases = encounters – retained catch) generated using the bias-corrected Conrad and McHugh (2008) approach. Briefly, encounters were estimated by dividing the creel estimate of legal-marked Chinook harvest by a test fishery-based estimate of the proportion of the fishable Chinook population that is of legal size and marked (i.e., our former “Method 2” approach; e.g., WDFW 2007a). Given that this approach yields negatively biased estimates if anglers release any of the legal-marked Chinook they encounter, Conrad and

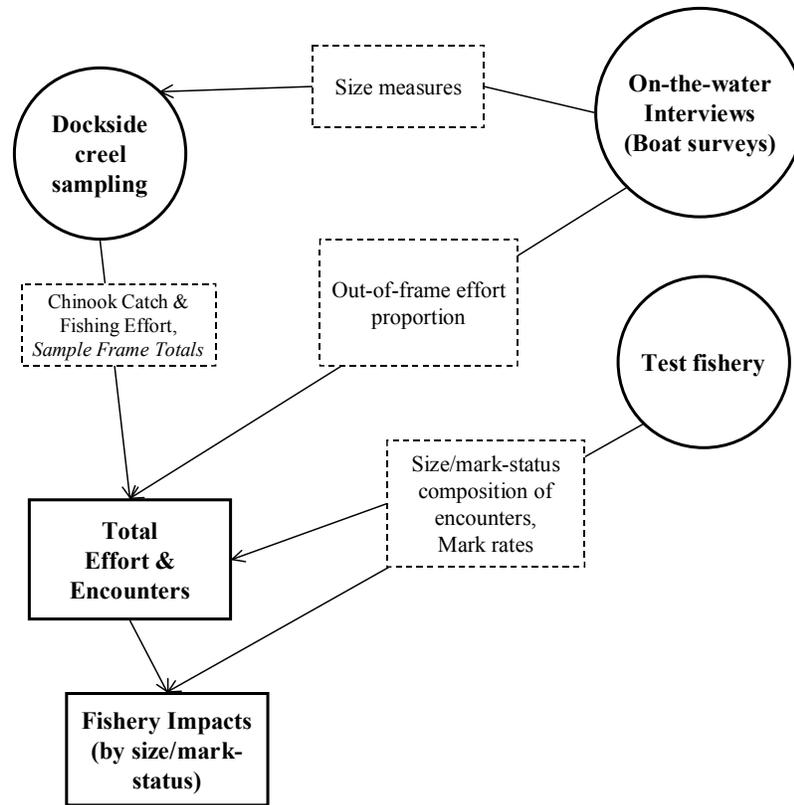
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<sup>4</sup> In a recent evaluation of bias in mark-selective fishery parameter estimates, Conrad and McHugh (2008) concluded that recall errors likely cause bias in interview-based estimates of total salmon *releases*. Thus, although estimates of total salmon releases based solely on angler-reported data were generated for this report (**Appendix D**), we focus exclusively on bias-corrected “Method 2” estimates of Chinook encounters (and releases) in our review of the Area 10 fishery.

McHugh estimated a “correction” factor to account for this phenomenon and incorporated it into their estimator (see **Appendix A** for complete computational details). Although we do not review estimates of Chinook releases based solely on angler accounts in our assessment, we supply these estimates, as well estimates of retained catch and/or releases for other salmon species, in appendices to this report (**Appendix D**).

In the Area 10 winter selective fishery we modified our protocol slightly for collecting and analyzing on-the-water survey data during the month of December only. We elected to stratify survey data based on “Tengu Derby” days (each Sunday in December) verses non-Tengu days. The Tengu Derby is the longest running salmon derby in Washington State and is open to ‘moochers’ (defined in WDFW reports as ‘weight and bait’) only. In the December 2007 selective fishery the Tengu Derby occurred every Sunday (5 Sundays) throughout the month and was confined to Elliott Bay. We conducted 2 boat surveys on 2 Sundays during the month of December. Anglers were specifically asked whether or not they were derby participants, and samplers noted this information on the survey form. Most of the derby participants originated from the Don Armeni Ramp in West Seattle. We separated out Tengu anglers from the boat survey data to obtain site size measures for non-Sundays. We included Tengu anglers for calculating Sunday size measures throughout the month. Tengu anglers made up a significant portion of the angling effort at Armeni Ramp on the two Sunday angler surveys, with the unadjusted percentage of effort increasing to 23% (with Tengu anglers) from 8% (without Tengu anglers; see **Appendix E** for a summary of Tengu versus non-Tengu size measures).

As a final note, given the higher catch per unit effort (CPUE) of charter anglers relative to that of the private recreational fleet and the difficulty in directly sampling their catch (e.g., due to private moorage), we acquired creel data for these anglers through a separate but comprehensive effort. We contacted known salmon charters operating in Area 10 and coordinated with them so that they would complete and return creel information for all trips taken using supplied Voluntary Trip Report (VTR) forms. Total salmon catch (kept and released) and fishing effort data were assumed to be the result of a complete census and simply added to the survey-based estimates generated for the private fleet. Although they were not used in producing creel estimates, VTRs were also completed and returned by a subset of private fleet anglers.



**Figure 2.** Conceptual diagram of the monitoring plan implemented in Area 10 during its December 1, 2007 to January 31, 2008 mark-selective Chinook season. Circles represent discrete sampling activities, dashed boxes represent parameters that are estimated using data from a given activity, and solid boxes depict key quantities estimated from the comprehensive plan. ‘Encounters’ includes both harvested and released Chinook salmon.

### **Test Fishery Methods**

In order to obtain accurate estimates (i.e., free from survey-based recall error) of the size (legal or sublegal) and mark-status (marked or unmarked) composition of the pool of Chinook salmon encountered by anglers participating in the fishery, we conducted a recreational test fishery during the entirety of the mark-selective Chinook season (**Table 1**). Our test boat crew consisted of two WDFW technicians, each fishing with a single rod for five days a week (Monday-Friday). Test fishers focused their efforts at locations that optimized their overall encounter rate and mirrored choices made by the at-large private fleet. Also, test fishers fished for Chinook using the same methods as the recreational fleet, as prescribed by supervisory staff based on dockside interview results for the preceding week. For each fish brought to boat, test fishers logged details on its identity (species), size (fork length and total length), and, if appropriate, mark status (marked or unmarked). For Chinook salmon encounters only, test fishers additionally collected scale and DNA samples (~1-cm<sup>2</sup> piece of dorsal tissue).

## Estimating Fishery Impacts

### *Total Encounters and Mortalities*

We characterized the overall impacts of the fishery in terms of grand-total estimates of encounters and mortalities and by using estimates specific to each of the four size/mark-status groups (i.e., legal-marked [LM], sublegal-marked [SM], legal-unmarked [LU], and sublegal-unmarked [SU]; **Table 1**). As indicated above and in contrast to previous post-season MSF reports, we used only one approach to estimate total Chinook encounters and, consequently, mortalities. This single method was selected as a result of a thorough state-tribal review of bias potential in estimators of encounters in MSFs (see Conrad and McHugh 2008 for details). In brief, total encounters were estimated by dividing creel estimates of legal-marked Chinook harvest by the test fishery-based proportion of the targeted Chinook population that was of legal size and marked, inclusive of a bias correction accounting for the modest level of “high grading” that may occur in this fishery. We then decomposed total encounters into size/mark-status group-specific estimates using test-fishery encounters composition data.

We estimated total Chinook mortality resulting from the fishery by applying assumed mortality rates to the total harvest and release estimates for the four size/mark-status groups (LM, LU, SM, and SU). For retained Chinook, the mortality estimate was equivalent to the total harvest estimate for the applicable size/mark-status group. We applied selective fishing mortality (*sfm*) rates of 15% and 20% to legal (marked and unmarked) and sublegal (marked and unmarked) release totals, respectively, to estimate release mortality. See **Appendix A** for a complete description of our impact estimation procedure, including formulae for total and variance estimators.

The final step of our overall impacts assessment involved comparing fishery outcomes to pre-season expectations. To do this, we compared season-total estimates of Chinook encounters and mortalities to pre-season modeled values (FRAM model run number 3907) for each size and mark status category.

**Table 1.** Sampling/estimation details on target parameters associated with the overall Areas 8-1 and 8-2 mark-selective fishery monitoring program (**Figure 1**).

Activity	Focal Parameter(s)	Secondary Parameter(s)	Sample Unit(s)	Finest Estimation Time Step	Comments
Dockside Creel Sampling	Fishing effort (boat & angler trips); kept and released fish <sup>1</sup>	Catch rates (CPUE); length, age, and CWT composition of harvest <sup>2</sup>	Angler trip; kept fish; reported fish release	Week <sup>1</sup>	Within weeks, estimates are also produced by strata (weekday/weekend).
Test Fishing	Size (legal/sublegal) and mark-status composition (marked, unmarked) of encountered Chinook	Chinook length, age, and DNA-based <sup>3</sup> stock composition; species composition of non-Chinook encounters	Fish encounter	Season (2 months)	Too few encounters occurred to assess mark rates on a finer time scale.
Overall Fishery Impacts Estimation	Total Chinook encounters and mortalities, by size/mark-status group	Ratios of encounters and mortalities per kept Chinook	N/A	Season (2 month)	
Coded-wire tag (CWT) Impacts Estimation	Marked/unmarked double-index tag (DIT) encounters and mortalities	N/A	N/A	Season (2 month)	The temporal resolution of DIT impacts is constrained by the total number of tags recovered.

<sup>1</sup> Under the "bias-corrected Method-2" approach, Chinook releases can be estimated only as finely as test fishery data allow.

<sup>2</sup> The length and CWT composition of landed catch was assessed on a season-wide basis for impact estimation.

<sup>3</sup> Though samples were collected, DNA-based estimates of stock composition are not yet available for this fishery.

### *CWT Impacts*

To understand the potential effects of the Area 10 fishery on CWT-based cohort-reconstruction efforts, we estimated the total number of unmarked-tagged Chinook mortalities that may have occurred during the course of its season. We acquired information for all marked CWT double index tag (DIT) groups present in landed catch and then applied the methods described by the Selective Fisheries Evaluation Committee – Analysis Work Group (SFEC-AWG 2002) to estimate the number of unmarked DIT fish encountered<sup>5</sup>. We subsequently estimated the number of these fish that may have died due to hook-and-release impacts using an *sfm* analogous that was used in FRAM modeling. Given our interest in characterizing the impacts of mark-selective regulations on the CWT program and not recreational fishing in general, we used an *sfm* of 10% in all unmarked-DIT mortality calculations. Thus, we used 10% instead of 15% (applied above to legal-sized releases) since unseen drop-off mortality (the 5% differential) should theoretically be the same for selective and non-selective fisheries.

<sup>5</sup> For all unmarked-DIT encounters and mortalities calculations, we relied on the DIT unmarked-to-marked ratio ( $\lambda$ ) estimated at the time of juvenile release.

## RESULTS & DISCUSSION

### Summary of Sampling Efforts

#### *Sampled Access Sites*

Sites within the Area 10 sample frame included Armeni Public Ramp, Edmonds Marina (Dry Storage), Kingston Public Ramp, Manchester Public Ramp, and Shilshole Public Ramp. All sites within the sample frame were sampled at least once during the duration of the fishery and appear in **Table 2** and **Appendix F**. Sample sites for the first week of the fishery were selected based on historical catch and effort data and supervisor input.

**Table 2.** List of sites sampled during the Area 10 selective Chinook fishery.

Area 10 Sampled Sites	Total Days Sampled	% of Total
Armeni Public Ramp	28	34.1%
Edmonds Dry Storage	3	3.7%
Kingston Public Ramp	10	12.2%
Manchester Public Ramp	8	9.8%
Shilshole Public Ramp	33	40.2%
<b>TOTAL</b>	<b>82</b>	<b>100.0%</b>

#### *Boat Survey Summary*

We conducted a total of 6 boat surveys during the Area 10 winter selective fishery (**Table 3**). Boat surveys were used to estimate the percentage of effort from sites within the sample frame (versus sites out of the sample frame), and the proportion of angler effort originating at each access site. In the 6 boat surveys samplers interviewed 190 boats with 316 anglers; of these, 178 anglers (56%) exited the fishery via sites within the sample frame. An additional 62 Tengu Derby participants were encountered during on-the-water surveys (**Appendix E**).

Winter fishery characteristics were such that on foul weather days and weekdays, angling effort was minimal or non-existent. We attempted to complete boat surveys on days when it was logistically feasible and when we expected to capture the most angling effort. Four boat surveys were cancelled and rescheduled due to inclement weather (all during December).

**Table 3.** Monthly summary of boat surveys conducted during the Area 10 selective fishery, December 1, 2007 through January 31, 2008.

<b>Boat Survey Schedule: Area 10</b>	
<b>Month</b>	<b>Date Conducted</b>
December	12/9, 12/21, 12/23, 12/29
January	1/12, 1/13
<b>Total Surveys</b>	<b>6</b>

## Fishery Characteristics

### *Estimates of Fishing Effort and Catch*

For private boats fishing in the Area 10 winter selective fishery we estimated that a total of 645 Chinook (624 marked and 21 unmarked) were retained over the course of 2,534 angler trips (**Table 4**). We estimated that anglers released a total of 2,391 Chinook (1,881 marked and 510 unmarked). Thus, the total number of Chinook encountered by private boats in the Area 10 winter selective fishery was 3,036. In addition, we estimated that anglers retained 60 chum salmon and released 53 coho salmon (15 marked and 38 unmarked) (**Appendix D**).

Charters constituted a very minor portion of the Area 10 effort total (<0.4% of all angler trips). Two charter operators reported 10 angler trips (4 boat trips) in Area 10 during the December-January fishery. Charter anglers encountered 84 Chinook of which 11 were harvested (all marked). Charter CPUE (catch per unit of effort) was significantly higher than that of private boats with 1.4 Chinook retained per angler trip. Charter anglers released one legal marked Chinook.

**Table 4.** Estimates of total fishing effort and the total number of salmon kept and released during the December 1, 2007 to January 31, 2008 Area 10 selective fishery. Values may not add exactly due to rounding error.

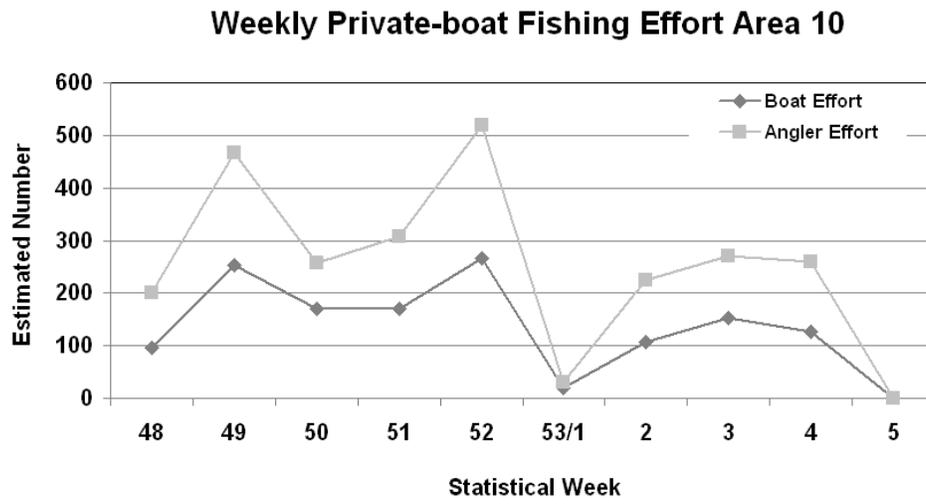
<b>Month</b>	<b>Date Range</b>	<b>Angler Category</b>	<b>Effort<sup>1</sup></b>		<b>Retained Chinook<sup>1</sup></b>		<b>Released Chinook<sup>2</sup></b>		<b>Total</b>
			<b>Boats</b>	<b>Anglers</b>	<b>AD</b>	<b>UM</b>	<b>AD</b>	<b>UM</b>	
DEC	12/1-1/1	Private	957	1,751	412	21	1,242	330	2,005
		Charter	3	8	11	0	55	14	80
JAN	1/2 - 1/31	Private	403	783	212	0	639	181	1,032
		Charter	1	2	0	0	4	0	4
<b>Creel subtotal:</b>			1,360	2,534	624	21	1,881	510	3,036
<b>Charter subtotal:</b>			4	10	11	0	59	14	84
<b>Grand Total:</b>			1,364	2,544	635	21	1,940	524	3,120
<b>Variance:</b>			16,977	51,851	7,001	162	281,646	22,511	644,424
<b>CV (%):</b>			10%	9%	13%	61%	27%	29%	26%
<b>95% CI:</b>			1,109-1,619	2,098-2,990	471-799	3-46	900-2,980	230-818	1,547-4,694

<sup>1</sup> Estimated boats, anglers, and retained salmon catch were estimated via the Murthy estimator method.

<sup>2</sup> Released Chinook were estimated as the difference between total Chinook encounters generated using a bias-corrected "Method 2" estimator. See Appendix A and Conrad and McHugh (2008) for additional details.

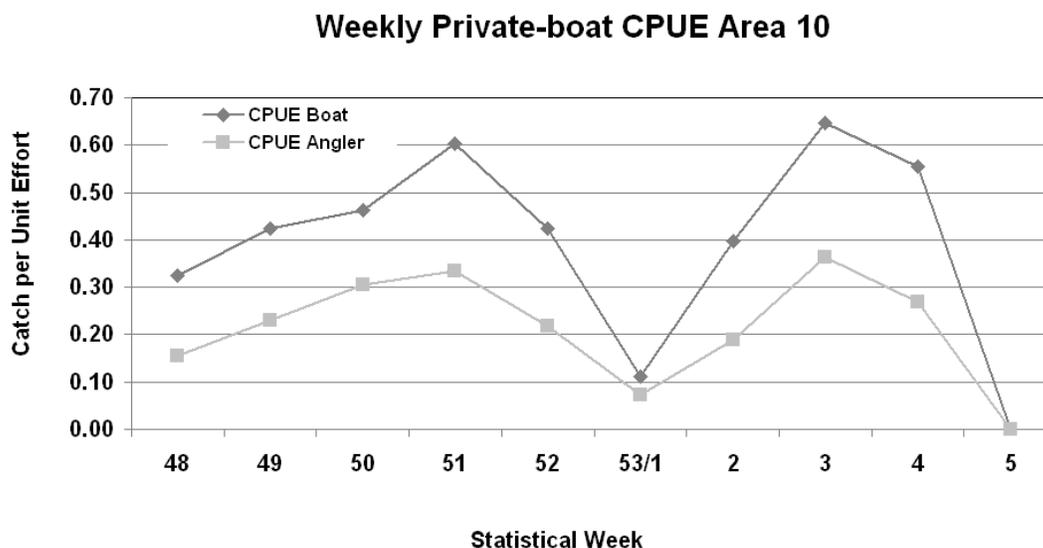
*Trends in Angling Effort, CPUE, and Total Chinook Encounters*

Angling effort was low to moderate during the two-month Area 10 winter selective Chinook fishery. Effort peaked in statistical week 52 (which coincided with the Christmas holiday) with 519 estimated angler trips and was at its lowest in the final week of the fishery, when zero angler trips were estimated (**Figure 3**). Angler effort was lowest on weekdays, with an average of 16 estimated angler trips per day, while it was moderate on Fridays with an average of 31 angler trips per day, and highest on weekends, averaging 83 angler trips per day. In total, anglers made 2,544 estimated angler trips throughout the two-month fishery.



**Figure 3.** Temporal patterns in fishing effort during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery. See the WDFW statistical week calendar in **Appendices B1** and **B2** for day and month equivalents to plotted statistical weeks.

Catch per Unit of Effort (CPUE) for the Area 10 winter selective fishery was lower overall with a season wide CPUE of 0.25 Chinook retained per angler trip. CPUE was highest in week 51, with 0.34 Chinook retained per trip, and lowest (other than week 5, where no effort was recorded) in week 1 with 0.07 Chinook retained per angler trip (**Figure 4**).

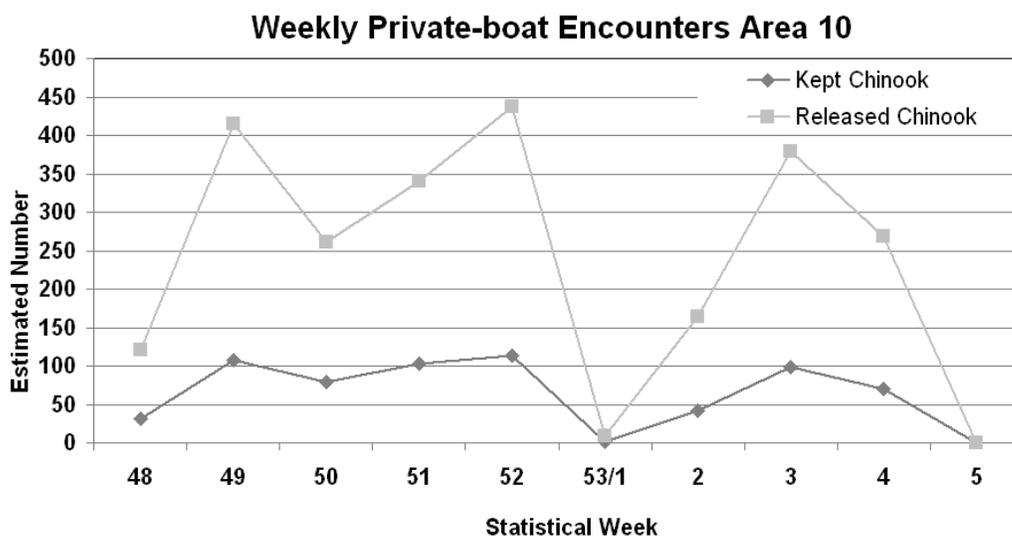


**Figure 4.** Temporal patterns in CPUE (landed Chinook per angler or boat trip) during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery. See the WDFW statistical week calendar in **Appendices B1** and **B2** for day and month equivalents to plotted statistical weeks.

We estimated that private boats retained 645 Chinook (624 marked and 21 unmarked) and released 2,391 Chinook (1,881 marked and 510 unmarked) in the Area 10 winter selective Chinook fishery (**Table 4**). Anglers retained an average of 65 Chinook per week and released an average of 239 Chinook per week over the course of the fishery. The highest number of weekly Chinook encounters occurred during week 52 with 550 Chinook encountered (113 retained and 437 released). The lowest number of weekly Chinook encounters (for weeks with measurable effort) occurred during week 1, with 10 Chinook encountered (2 retained and 8 released) (**Figure 5**).

Two charter operators who fished in the Area 10 winter selective fishery encountered a total of 84 Chinook (11 retained and 73 released) in 10 angler trips over the two-month fishery. The majority of Chinook encounters (67%) on charter vessels occurred during statistical week 50. Of the 73 released Chinook, 59 (81%) were marked and 14 were unmarked. Of the 14 unmarked releases 7, were legal-size and 7 were sub-legal size. Charter anglers experienced a much higher CPUE, with 1.1 Chinook retained per angler trip, compared to the private angler overall CPUE of 0.25.

Adding the estimates of private boat angler and charter angler encounter reports yields a total estimate of 656 Chinook retained (635 marked and 21 unmarked) in 2,544 angler trips (**Table 3**). Additionally, charter and private boat anglers released a total of 2,464 Chinook (1,940 marked and 524 unmarked). For private and charter vessels combined, we estimated that a total of 3,120 Chinook (656 retained and 2,464 released) were encountered in the two-month Area 10 winter selective fishery.



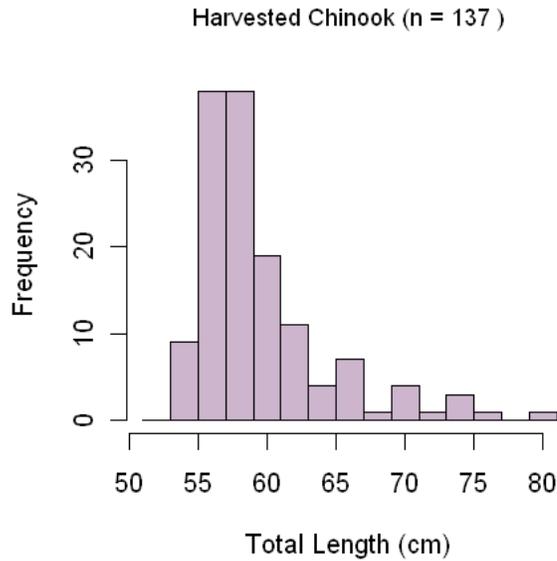
**Figure 5.** Temporal patterns in total Chinook harvest and releases during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery. See the WDFW statistical week calendar in **Appendices B1** and **B2** for day and month equivalents to plotted statistical weeks.

*Characteristics of Harvested Chinook*

Length samples were collected from 140 Chinook salmon (137 marked and 3 unmarked) during dockside angler interviews (**Table 5**). All of the fish sampled were measured (fork length and total length) and examined for the presence of a coded wire tag (CWT). Retained Chinook ranged from 53 to 80 cm total length and averaged 59 cm (SD = 5.6cm; **Figure 6**). Twenty-one of the 140 (15%) Chinook sampled were sub-legal size. At 54.8 cm, the average length of these fish was 1 cm less than the legal limit (55.8), indicating that some sub-legal retention may have been a result of measurement error.

**Table 5.** Summary of length samples collected during dockside angler interviews from retained Chinook salmon in the Area 10 selective Chinook fishery, December 1, 2007 – January 31, 2008.

Mark Type	Number Sampled		
	Legal-size	Sublegal-size	Total
Marked	116	21	137
Unmarked	3	0	3
Undetermined	0	0	0
<b>Total</b>	<b>119</b>	<b>21</b>	<b>140</b>



**Figure 6.** Length-frequency distribution of retained marked Chinook sampled at dockside during the Area 10 mark-selective Chinook fishery, December 1, 2007 – January 31, 2008.

Scale samples were collected from all Chinook sampled (140) and 130 (93%) of these could be read. Of the marked Chinook that were aged (127), 112 (88%) were from brood year 2005 and 15 (12%) were from brood year 2004 (**Appendix G**). The majority of harvested Chinook were subyearling outmigrants.

#### *CWT Samples*

Samplers recovered a total of 12 (11 marked and 1 unmarked) coded-wire tags from the 140 retained Chinook that were sampled during dockside angler interviews. Of the 12 CWT recoveries, 75% were from Puget Sound hatcheries (25% each from South, Central, and North Puget Sound), while 25% were from Hood Canal hatcheries (**Table 6; Appendix H**). Of the 12 recoveries, half were associated with a double-index tag (DIT) group (See *Overall Fishery Impacts: Estimated CWT-DIT Impacts* for estimated unmarked DIT mortality results).

**Table 6.** Summary of coded-wire tags recovered from Chinook salmon harvested during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery. The “No. DITs” field corresponds to the number of tags that belonged to double-index tag groups.

Release Region <sup>1</sup>	Release Site	Rearing Location	CWT's Recovered	No. DIT's
Hood Canal	Finch Creek	Hoodsport Hatchery	1 (8.3%)	
	Purdy Creek	George Adams Hatchery	1 (8.3%)	1
	Skokomish River	Ricks Pond	1 (8.3%)	
Puget Sound-Central	Gorst Creek	Gorst Creek Rearing Pond	1 (8.3%)	
	Grovers Creek	Grovers Creek Hatchery	2 (16.7%)	2
Puget Sound-North	Cascade River	Marblemount Hatchery	1 (8.3%)	1
	Friday Creek	Sammish Hatchery	2 (16.7%)	2
Puget Sound-South	Chambers Creek	Chambers Creek + Garrison Hatcheries	1 (8.3%)	
	Chambers Creek	Lakewood Hatchery	1 (8.3%)	
	White River	White River Hatchery	1 (8.3%)	
<b>Grand Total</b>			<b>12</b>	<b>6</b>

<sup>1</sup>Unofficial release regions. Puget Sound regions were designated based on the WDFW marine catch area containing the river/stream network where juvenile releases originated (i.e., Areas 11 and 13 = South; Areas 9 and 10 = Central; and Areas 7, 8-1, and 8-2 = North).

## **Test Fishing Results**

### *Gear Types and Fishing Time*

The test boat in the Area 10 winter selective fishery attempted to duplicate the fishing methods that private boat anglers used to encounter Chinook by using fishing methods in the same proportions as those reported by anglers during creel interviews. Fishing with downriggers was the predominate method used by anglers to encounter Chinook in the Area 10 winter fishery. A total of 166 boats were interviewed that encountered Chinook; of these 113 (68%) used downriggers as the predominate method to encounter Chinook, while 52 (31%) used the weight and bait method (also referred to as ‘mooching’; **Table 7**). The proportion of boats using the weight and bait method was higher in this fishery (versus other winter mark-selective fisheries) due to the Tengu Derby occurring in the month of December (see *Catch and Effort: Sampling and Estimation*, in the methods section on page 10 for information on Tengu Derby). Test fishers used downriggers as a fishing method 56% of the total fishing time and used weight and bait 44% of the total fishing time.

Test fishers in the Area 10 winter selective fishery were scheduled to fish 5 days per week during the two-month fishery but poor weather conditions were the limiting factor to the test fishing activity (**Table 8**). Test fishers were unable to fish the first week of the fishery because of poor weather conditions, and fishing time averaged just over 10.5 hours per week. Test fishers fished 21 days out of a possible 45 and logged almost 96 hours of fishing time. Test

fishers were also unable to fish a complete 5 day week in any week through the course of the fishery (**Table 8**).

**Table 7.** Fishing methods employed by private recreational anglers (from dockside interviews, based on number of boat trips sampled,  $n = 166$ ) and test fishers (based on hours fished,  $n = 95.9$ ) during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery.

Statistical Week	DR		WB		Diver		Jig		Other	
	Tst Boat	Private	Tst Boat	Private	Tst Boat	Private	Tst Boat	Private	Tst Boat	Private
48	0.0%	47.4%	0.0%	52.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
49	0.0%	63.0%	0.0%	37.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
50	100.0%	43.5%	0.0%	56.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
51	100.0%	56.5%	0.0%	43.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
52	32.0%	84.2%	68.0%	15.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
53/1	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2	60.0%	86.4%	40.0%	9.1%	0.0%	0.0%	0.0%	4.6%	0.0%	0.0%
3	0.0%	83.3%	100.0%	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4	0.0%	88.2%	100.0%	11.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>Total</b>	<b>56.0%</b>	<b>68.1%</b>	<b>44.0%</b>	<b>31.3%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.6%</b>	<b>0.0%</b>	<b>0.0%</b>

#### *Chinook Encounters and Mark Rates*

Test fishers for the Area 10 winter selective fishery encountered 120 Chinook (31 legal and 89 sublegal) in their 21 days and 96 hours of fishing time. The test boat catches show that just 26% of their Chinook encounters were legal size. A large portion of the Chinook encounters were adipose fin clipped, with a legal size mark rate of 77% and an overall mark rate of 83%. For the duration of the Area 10 winter fishery, the season total catch composition was 20.0% legal and marked; 5.8% legal and unmarked; 62.5% sublegal and marked; and 11.7% sublegal and unmarked (**Table 8**). We ultimately used these pooled season-wide estimates in our overall fishery impact estimation scheme (**Table 1**).

**Table 8.** Composition of test fishery Chinook encounters and associated mark-rate and size/mark-status proportion estimates (SE = standard error) for the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery.

Stat Week	Fishing Effort		Legal		Sublegal		Total
	Days	Hours Fished	AD	UM	AD	UM	
49	0	0	0	0	0	0	0
50	4	25.4	8	3	36	5	52
51	3	13.9	6	3	9	2	20
52	3	7.6	1	0	4	2	7
53/1	3	10.4	3	1	2	1	7
2	2	10.9	1	0	5	2	8
3	3	12.9	3	0	10	1	14
4	3	14.8	2	0	9	1	12
5	0	0	0	0	0	0	0
<b>Total</b>	<b>21</b>	<b>95.9</b>	<b>24</b>	<b>7</b>	<b>75</b>	<b>14</b>	<b>120</b>
<b>Size/mark-status composition:</b> 0.200 (0.001) 0.058 (0.000) 0.625 (0.002) 0.117 (0.001) <b>Legal size mark rate:</b> 0.77 (0.01) <b>Overall mark rate:</b> 0.83 (0.00)							

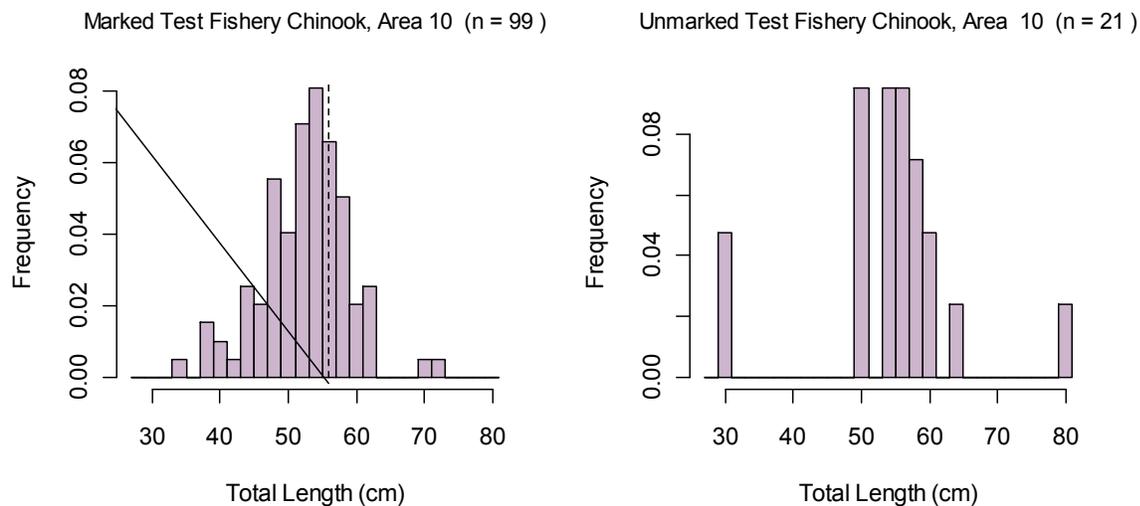
Mark rates reported on VTRs from private and charter boats were similar to mark rates in the test fishery. Private (non-charter) boat anglers who returned VTRs showed a legal size mark rate of 100% and an overall mark rate of 95.8% (**Table 9**). Charter operators reported a 61% legal size mark rate and an 83% overall mark rate (**Table 4**).

**Table 9.** Total Chinook encountered (retained and released) by private (non-charter) boat anglers reporting their catch on voluntary trip reports (VTRs) during the Area 10 mark-selective Chinook fishery (December 1, 2007 through January 31, 2008), with estimates of legal-size, sublegal-size, and overall mark rates.

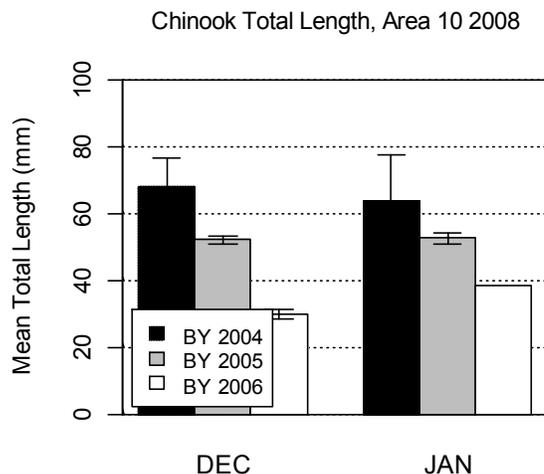
		Month			Total	% Marked
Size	Mark Status	December (4 VTR's)	January (5 VTRs)			
Legal	Marked	5	3	8	100.0%	
	Unmarked	0	0	0		
	<b>Subtotal</b>	<b>5</b>	<b>3</b>	<b>8</b>		
Sublegal	Marked	2	13	15	93.8%	
	Unmarked	0	1	1		
	<b>Subtotal</b>	<b>2</b>	<b>14</b>	<b>16</b>		
<b>Total</b>		<b>7</b>	<b>17</b>	<b>24</b>	<b>95.8%</b>	

*Chinook Size and Age*

An analysis of test fishery length data indicated that the majority of fish encountered were of sublegal size (74%; **Figure 7**). The average size of Chinook encountered was 52.6, with a minimum of 29.0 cm and a maximum of 79.4 cm ( $n = 120$ ). The overall mean size of was slightly higher for unmarked Chinook encountered (54.1 cm UM versus 52.4 cm AD), but the difference was not statistically significant (two sample  $t$ -test:  $t = -0.71$ ,  $df = 23$ ,  $P = 0.483$ ). Given the abundance of sublegal Chinook in the test fishery, the average size of fish in the test fishery (52.6 cm) was lower than that of harvested Chinook (59.0 cm). Analysis of the 116 readable scale samples obtained from test fishers showed that a majority (92%) of these fish were of brood year 2005 origin (i.e., age 2 in December or Age 3 in January; **Figure 8**, **Appendix G**). Additionally, most of these fish (97% for marked, 95% for unmarked) were subyearling outmigrants.



**Figure 7.** Length-frequency distributions of marked (left panel) and unmarked (right panel) Chinook encountered by test fishers during the Area 10 December 1-January 31, 2008 mark-selective Chinook fishery. The dashed vertical line in the marked Chinook plot corresponds to the legal size limit (22 in or 56 cm).



**Figure 8.** Monthly mean total length (+/- 95% CIs) of Chinook sampled by test fishers during the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery, by brood year.

*Other Fish Species Encountered*

Other than Chinook salmon, Area 10 test fishers encountered coho salmon (*Oncorhynchus kisutch*) and 9 different species of marine fish (**Table 10**). In total, test fishers caught and released 92 other species (2 coho and 90 marine fish). Over two-thirds of the marine fish encounters consisted of Pacific sanddab (*Citharichthys sordidus*).

**Table 10.** Test fishery catches of species other than Chinook salmon during the Area 10 December 1, 007 - January 31, 2008 mark-selective Chinook fishery.

<b>TOTALS FOR OTHER SPECIES ENCOUNTERED</b>	
<b>Area-10 Test Fishery</b>	
<b>Species</b>	<b>Total Catch</b>
Coho ( <i>Oncorhynchus kisutch</i> )	2
Copper rockfish ( <i>Sebastes caurinus</i> )	3
Quillback rockfish ( <i>Sebastes maliger</i> )	3
Dogfish shark ( <i>Squalus acanthias</i> )	3
Pacific Staghorn sculpin ( <i>Leptocottus armatus</i> )	7
Red Irish Lord ( <i>Hemilepidotus hemilepidotus</i> )	2
Cabezón ( <i>Scorpaenichthys marmoratus</i> )	1
Buffalo Sculpin ( <i>Enophrys bison</i> )	2
Pacific sanddab ( <i>Citharichthys sordidus</i> )	62
Rock sole ( <i>Lepidopsetta bilineata</i> )	7
<b>GRAND TOTAL</b>	<b>92</b>

**Overall Fishery Impacts***Total Encounters and Mortalities*

Based on the combination of dockside sampling results (**Table 4**), test fishery size/mark-status composition data (**Table 8**), and censused charter catch, we estimated that 619 legal-marked, 184 legal-unmarked, 1,956 sublegal marked, and 361 sublegal unmarked Chinook salmon were encountered by anglers fishing in the Area 10 selective fishery from December 1, 2007 to January 31, 2008 (**Table 11**). The encounters were comprised mainly of released salmon (79%), with anglers releasing 4.8 Chinook (marked and unmarked combined; ~1 for unmarked only) for every 1 retained.

Given the assumed mortality rates of 0.20 for sublegal and 0.15 for legal size Chinook salmon, we also estimated that 12 legal-marked, 24 legal-unmarked, 372 sublegal-marked and 72 sublegal-unmarked (481 overall) Chinook were killed due to the effects of handling and release (**Table 11**). Adding the release mortality (481) to the mortality from retained Chinook (656) gives us a total mortality of 551 legal-marked, 45 legal-unmarked, 468 sublegal-marked, and 72 sublegal-unmarked Chinook for a total mortality of 1,137 Chinook for the Area 10 winter selective fishery.

**Table 11.** Summary of season-wide fishery impact estimates for the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery. Values may not add up perfectly due to rounding error.

Total Encounters (E) <sup>a</sup> : 3,120										
V(E): 453,477										
Size/mark group	Encounters	No. Retained	No. Rel'd	Rel. Mort. Rate	Rel. Mort.	Total Mortality	Var	SE	95% CI	CV (%)
Legal marked	619	539	80	0.15	12	551	5,665	75	404 - 699	14
Legal unmarked	184	21	163	0.15	24	45	304	17	29526	38
Sublegal marked	1,956	96	1,860	0.20	372	468	11,295	106	259 - 676	23
Sublegal unmarked	361	0	361	0.20	72	72	648	25	22 - 122	35
All groups combined	<b>3,120</b>	<b>656</b>	<b>2,464</b>		<b>481</b>	<b>1,137</b>	<b>17,912</b>	<b>134</b>	<b>874 - 1399</b>	<b>12</b>

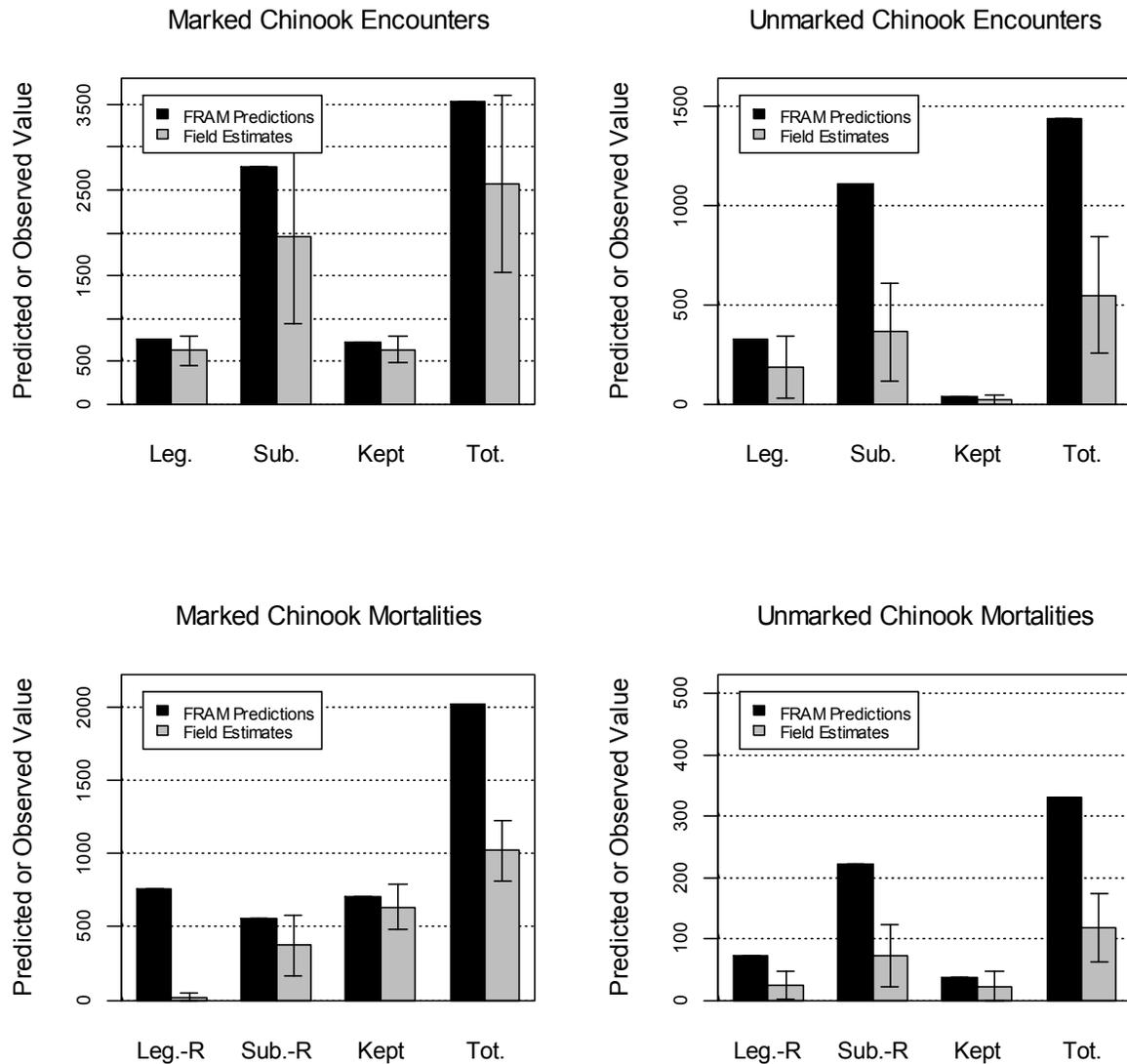
<sup>a</sup> Creel estimates: 624 Marked Retained + 21 Unmarked Retained + 2391 Released; Charters: 11 Marked Retained + 0 Unmarked Retained + 73 Released = Total encounters 3,120.

### *FRAM versus Creel Comparison*

The estimated numbers of Chinook encounters and mortalities resulting from the Area 10 winter selective fishery were considerably less than predicted based on pre-season FRAM modeling results. The FRAM model predicted a total of 4,970 Chinook would be encountered during the fishery; field estimates indicate that actual encounters were approximately 38% less than predicted (3,120) (**Table 12; Figure 9**). Predicted marked Chinook encounters from FRAM were 27% higher than those estimated from field data, and unmarked Chinook encounters were 62% less than those predicted by FRAM. Predicted mark rates for legal and sublegal size classes were similar to those estimated via creel surveys; FRAM predicted a 71% overall mark rate, while creel data estimated a mark rate of 82.5% (**Table 12**).

**Table 12.** Comparison of modeled (i.e., using FRAM, model run 3907) and estimated total Chinook encounters for the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery.

Data Source	Group	Total Encounters	Legal	Sublegal	Landed Only
FRAM Encounters	Unmark.	1439	329	1110	37
	Mark.	3531	756	2775	711
	Total	4970	1085	3885	748
	% Mark.	71.0	69.7	71.4	95.1
Estimated (Creel) Encounters	Unmark.	545	184	361	21
	Mark.	2575	619	1956	635
	Total	3120	803	2317	656
	% Mark.	82.5	77.1	84.4	96.8



**Figure 9.** Comparison of modeled (i.e., using FRAM, model run 3907) and estimated total Chinook encounters and mortalities for the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery. Error bars represent approximate 95% confidence intervals for field estimates.

The FRAM model predicted that a total of 2,351 Chinook would die (harvest and release mortality) as a result of the Area 10 winter selective fishery (331 unmarked and 2,020 marked) (**Table 13**). Creel estimates indicated that the actual number of mortalities was half or less than half of the FRAM prediction. Total mortality estimated from creel results was 1,137 Chinook (118 unmarked and 1,019 marked), which is 48% of the predicted mortality (**Table 13; Figure 9**). The FRAM model most accurately predicted total landed mortalities for the Area 10 winter selective fishery, predicting that 748 Chinook would be landed, compared to 656 (88% of predicted) landed Chinook estimated via creel surveys.

**Table 13.** Comparison of modeled (i.e., using FRAM, model run 3907) and estimated total Chinook mortalities for the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery.

Mortality Category	FRAM Chinook Mortalities			Estimated Chinook Mortalities		
	Unmark.	Mark.	Total	Unmark.	Mark.	Total
Total (Landed + Released)	331	2020	2351	118	1019	1137
Released Legal	72	754	826	24	12	36
Released Sublegal	222	555	777	72	372	444
Landed Only	37	711	748	21	635	656

*Estimated CWT-DIT Impacts*

Of the 12 coded-wire tags recovered during the Area 10 mark-selective Chinook fishery, 6 belonged to double-index tag (DIT) release groups (**Table 14**). Based on the release details associated with these tags and their unmarked sister groups, we obtained an estimate of the unmarked-to-marked ratio ( $\lambda$ ) at juvenile release for each applicable hatchery of origin and brood year, and we used this value to estimate total unmarked DIT encounters for the entirety of the Area 10 fishery. In total, we estimated that 25 unmarked-DIT Chinook were caught and released during the fishery. Given an *sfm* rate of 0.10, we estimate that as many as three of these unmarked-DIT Chinook may have died as a result of the two-month Area 10 winter mark-selective fishery.

**Table 14.** Summary of double-index tagged (DIT) Chinook kept by anglers, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the Area 10 December 1, 2007 - January 31, 2008 mark-selective Chinook fishery.

Hatchery	Brood Year	DITs Obs'd	AD DIT Harvest		UM DIT Enc.	UM DIT Mortality	
			Est.	var(Est.)		Est.	var(Est.)
George Adams Hatchery	2005	1	3.9	11.00	3.86	0.39	0.11
Grovers Creek Hatchery	2005	2	10.2	41.71	7.81	0.78	0.25
Marblemount Hatchery	2004	1	5.1	20.86	5.02	0.50	0.20
Samish Hatchery	2005	2	8.9	31.86	8.13	0.81	0.26
<b>TOTAL</b>		<b>6</b>	<b>28.1</b>	<b>105.43</b>	<b>24.81</b>	<b>2.48</b>	<b>0.82</b>

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## APPENDICES

## Appendix A. Mark-selective fishery impact estimation details.

Below are definitions and equations for all quantities used in estimating mark-selective fishery impacts from the combination of creel survey information, test fishery results, and (where applicable) charter and/or derby accounts. The estimation sequence builds from monthly<sup>6</sup> estimators of encounters-by-class (i.e., the four size [legal, sublegal] × mark-status [marked, unmarked] groups) to season-wide impact estimates. Where appropriate, the encounters (kept and released) for charter, derby, and/or other fishery components assessed via a complete census (i.e., totals without variance) are simply added to relevant total private-fleet estimates.

### A. Total and Class-specific Encounters Estimation

The first step towards quantifying mark-selective fishery impacts by size/mark-status class is to estimate total Chinook encounters ( $\hat{E}_i$ , includes retained + released Chinook; See *Monthly Encounters* below) for each month of the fishery. Secondly, encounters are apportioned to the appropriate size/mark-status group using encounters-composition data collected in the test fishery (See *Test-fishery Encounter Composition* on following page).

#### Monthly Encounters

$\hat{E}_i$  = Total Chinook encounters for month  $i$ , which is estimated by combining creel estimates of legal-marked Chinook harvest ( $\hat{K}_{LMi}$ , defined on subsequent page) with a test fishery-based estimate of the proportion of the fishable Chinook population that is of legal size and marked ( $\hat{p}_{LMi}$ , defined on subsequent page). Given the potential for negative bias in  $\hat{E}_i$  if anglers release any of the legal-marked Chinook that they encounter, the  $\hat{E}_i$  estimator also includes a “correction” to account for this phenomenon (i.e.,  $1-p_{LM-R}$ , where  $p_{LM-R}$  is the estimated legal-marked Chinook release rate)<sup>7</sup>.  $\hat{E}_i$  and its variance are estimated as:

$$(1) \quad \hat{E}_i = \frac{K_{LM}}{[\hat{p}_{LM}(1 - p_{LM-R})]}$$

$$(2) \quad \text{var}(\hat{E}_i) = \frac{1}{[(1 - p_{LM-R})^2]} * \left[ \frac{\hat{K}_{LMi}^2}{\hat{p}_{LMi}^2} * \left( \frac{\text{var}(\hat{K}_{LMi})}{\hat{K}_{LMi}^2} + \frac{\text{var}(\hat{p}_{LMi})}{\hat{p}_{LMi}^2} \right) \right]$$

<sup>6</sup> **Note:** For fisheries characterized by short-duration seasons (i.e., ~ 1 month), the “monthly” estimators described in this appendix are synonymous season-total estimators.

<sup>7</sup> Equations 1 and 2 were modified based on a recent state-tribal evaluation of sources of bias in estimates of total Chinook encounters in mark-selective fisheries. Based on a review of relevant data, the current operational  $p_{LM-R}$  (combined intentional and unintentional LM Chinook release rate) applied in the bias-corrected  $\hat{E}_i$  estimator is 0.13. See Conrad and McHugh (2008) for further detail.

Test-fishery Encounter Composition

$\hat{p}_{LMi}$  = the test-fishery estimate of the proportion of Chinook encounters that are legal-sized ( $L$ ) and marked ( $M$ ) during month  $i$

$\hat{p}_{LUi}$  = the estimated proportion of encounters that are legal-sized ( $L$ ) and unmarked ( $U$ )

$\hat{p}_{SMi}$  = the estimated proportion of encounters that are sublegal-sized ( $S$ ) and unmarked ( $M$ )

$\hat{p}_{LUI}$  = the estimated proportion of encounters that are sublegal-sized ( $S$ ) and unmarked ( $U$ )

For each  $XY$  combination (where  $X = L$  or  $S$  and  $Y = M$  or  $U$ ),  $\hat{p}_{XYi}$  and its variance is estimated as:

$$(3) \quad \hat{p}_{XYi} = n_{XYi} / n_i, \text{ and}$$

$$(4) \quad \text{var}(\hat{p}_{XYi}) = [\hat{p}_{XYi}(1 - \hat{p}_{XYi})] / (n_i - 1),$$

where  $n_i$  = the total number of fish encountered by test boats during month  $i$ .

Encounters by Size/Mark-status Class

$\hat{E}_{LMi}$  = estimated legal ( $L$ ), marked ( $M$ ) encounters during month  $i$

$\hat{E}_{LUI}$  = estimated legal ( $L$ ), unmarked ( $U$ ) encounters during month  $i$

$\hat{E}_{SMi}$  = estimated sublegal ( $S$ ), marked ( $M$ ) encounters during month  $i$

$\hat{E}_{SUI}$  = estimated sublegal ( $S$ ), marked ( $U$ ) encounters during month  $i$

For each  $XY$  combination (where  $X = L$  or  $S$  and  $Y = M$  or  $U$ ) excluding  $LM$ ,  $\hat{E}_{XYi}$  and an estimate of its variance are obtained from:

$$(5) \quad \hat{E}_{XYi} = \hat{E}_i * \hat{p}_{XYi}$$

$$(6) \quad \text{var}(\hat{E}_{XYi}) = \text{var}(\hat{E}_i) * \hat{p}_{XYi}^2 + \hat{E}_i^2 * \text{var}(\hat{p}_{XYi}) - \text{var}(\hat{E}_i) * \text{var}(\hat{p}_{XYi})$$

Since the  $\hat{E}_{LMi}$  estimate derived according to Eqn. 5 above is equivalent to that obtained by expanding  $\hat{K}_{LMi}$  by the constant  $1 - p_{LM-R}$ , its variance is estimated as:

$$(7) \quad \text{var}(\hat{E}_{LMi}) = \text{var}(\hat{K}_{LMi}) / (1 - \hat{p}_{LM=R})^2$$

**B. Estimating Retained and Released Numbers by Size/Mark-status Class**

Before total mortality can be estimated for each class ( $LM$ ,  $SM$ ,  $LU$ ,  $SU$ ), class-specific encounters must be separated into retention and release categories. First, given that harvest is estimated only to mark-status class for creel survey purposes (i.e., Murthy estimates or otherwise), estimates of marked

and unmarked Chinook retention must be assigned to size classes (See *Apportioned Estimates of Retention to Size Classes* on subsequent page); this is done using mark-status-specific size composition data from dockside sampling (See *Dockside Observations for Apportioning Retained Catch to Class* on subsequent page). Subsequently, size/mark-status group-specific releases are estimated as the difference between class-specific encounters and retention (See *Estimating Release Numbers by Class* on subsequent page).

Dockside Observations for Apportioning Retained Catch to Class

$\hat{d}_{LMK}$  = the estimated proportion of retained (kept,  $K$ ), marked ( $M$ ) Chinook salmon that were legal ( $L$ ); based on *season-wide*<sup>8</sup> dockside observations of marked Chinook (as is  $\hat{d}_{SMK}$ )

$\hat{d}_{SMK}$  = the estimated proportion of retained (kept,  $K$ ), marked ( $M$ ) Chinook that were sublegal ( $S$ )

The proportion of retained, marked fish in size class  $X$  ( $X = L$  or  $S$ ) and its variance are estimated as:

$$(8) \quad \hat{d}_{XMK} = n_{XMK} / n_{MK}$$

$$(9) \quad \text{var}(\hat{d}_{XMK}) = [\hat{d}_{XMK} * (1 - \hat{d}_{XMK})] / (n_{MK} - 1),$$

where  $n_{MK}$  and  $n_{XMK}$  are *season-wide* total dockside counts of marked fish and the subset of marked fish in size-class  $X$ , respectively.

$\hat{d}_{LUK}$  = the estimated proportion of retained (kept,  $K$ ), unmarked ( $U$ ) Chinook salmon that are legal ( $L$ ); estimated from *season-wide* dockside observations of unmarked Chinook (as is  $\hat{d}_{SUK}$ )

$\hat{d}_{SUK}$  = the estimated proportion of retained (kept,  $K$ ), unmarked ( $U$ ) Chinook that are sublegal ( $S$ )

The proportions of retained, unmarked fish belonging to legal and sublegal size classes and their respective variances are estimated as above (Eqns. 8 and 9) but using *season-wide* dockside observations on unmarked ( $U$ ), not marked Chinook salmon.

Apportioned Estimates of Retention to Size Classes

$\hat{K}_{LMi}$  = the estimated number of legal ( $L$ ), marked ( $M$ ) Chinook kept in month  $i$

$\hat{K}_{LUi}$  = the estimated number of legal ( $L$ ), unmarked ( $U$ ) Chinook kept in month  $i$

The number of kept, marked encounters, marked fish in size class  $X$  ( $L$  or  $S$ ) and its variance is estimated as:

$$(10) \quad \hat{K}_{XMi} = \hat{d}_{XMK} * \hat{N}_{MKi}$$

$$(11) \quad \text{var}(\hat{K}_{XMi}) = \text{var}(\hat{K}_{XMi}) * \hat{d}_{XMK}^2 + \hat{N}_{MKi}^2 * \text{var}(\hat{d}_{XMK}) - \text{var}(\hat{N}_{MKi}) * \text{var}(\hat{d}_{XMK})$$

---

<sup>8</sup> Due to small sample sizes for observed, harvested Chinook—particularly for sublegal and/or unmarked classes—dockside length data are pooled across the season to estimate  $\hat{d}_{yK}$ .

where  $\hat{d}_{XMK}$  and its variance are from 7 and 8 above and  $\hat{N}_{MKi}$  is the survey estimate of retained marked fish for month  $i$  defined in Eqn. 1.

$\hat{K}_{SMi}$  = estimated number of sublegal ( $S$ ), marked ( $M$ ) Chinook kept in month  $i$

$\hat{K}_{SUi}$  = estimated number of sublegal ( $S$ ), unmarked ( $U$ ) Chinook kept in month  $i$

The number of retained, unmarked fish belonging to legal and sublegal size classes is estimated according to Eqns. 10 and 11 above but using unmarked fish proportions and monthly retention estimates.

Estimating Release Numbers by Class

$\hat{R}_{LMi}$  = the estimated number of legal ( $L$ ), marked ( $M$ ) Chinook released in month  $i$

$\hat{R}_{LUi}$  = the estimated number of legal ( $L$ ), unmarked ( $U$ ) Chinook released in month  $i$

$\hat{R}_{SMi}$  = the estimated number of sublegal ( $S$ ), marked ( $M$ ) Chinook released in month  $i$

$\hat{R}_{SUi}$  = the estimated number of sublegal ( $S$ ), unmarked ( $U$ ) Chinook released in month  $i$

For each size/mark-status class (i.e.,  $XY$  combination [ $X = L$  or  $S$  and  $Y = M$  or  $U$ ]), the number of fish encountered and released is estimated as the difference between total size/mark-status class encounters ( $\hat{E}_{XYi}$ ) and retention ( $\hat{K}_{XYi}$ ) during month  $i$ . The estimator and its variance are:

$$(12) \quad \hat{R}_{XYi} = \hat{E}_{XYi} - \hat{K}_{XYi}$$

$$(13) \quad \text{var}(\hat{R}_{XYi}) = \text{var}(\hat{E}_{XYi}) + \text{var}(\hat{K}_{XYi})$$

**C. Estimating Total (and Class-specific) Monthly and Season-wide Mortality**

The application of assumed mortality rates (See *Assumed Mortality Rates for Retained and Released Chinook* below) to class-specific estimates of total retention and releases constitutes the final step in quantifying mark-selective fishery impacts.

Assumed Mortality Rates for Retained and Released Chinook

$m_K$  = retention mortality rate, 100% for all retained Chinook (reincarnation is rare among fishes)

$sfm_L$  = release mortality rate for legal ( $L$ ) Chinook, assumed to be a constant 15%

$sfm_S$  = release mortality rate for sublegal ( $S$ ) Chinook, assumed to be a constant 20%

Retention-mortality Estimates

$\hat{M}_{LMi}$  = estimated mortality due to legal ( $L$ ), marked ( $M$ ) Chinook harvest in month  $i$  ( $= \hat{K}_{LMi}$ ).

$\hat{M}_{LUi}$  = estimated mortality due to harvest of legal ( $L$ ), unmarked ( $U$ ) Chinook in month  $i$  ( $= \hat{K}_{LUi}$ ).

$\hat{M}_{SMi}$  = estimated mortality due to harvest of sublegal ( $S$ ), marked ( $M$ ) Chinook in month  $i$  ( $= \hat{K}_{SMi}$ ).

$\hat{M}_{SUK_i}$  = estimated mortality due to harvest of sublegal ( $S$ ), marked ( $M$ ) Chinook in month  $i$  ( $= \hat{K}_{SU_i}$ ).

Release-mortality Estimates

$\hat{M}_{LMR_i}$  = estimated post-release mortality for legal ( $L$ ), marked ( $M$ ) Chinook in month  $i$

$\hat{M}_{LUR_i}$  = estimated post-release mortality for legal ( $L$ ), unmarked ( $U$ ) Chinook in month  $i$

$\hat{M}_{SMR_i}$  = estimated post-release mortality for sublegal ( $S$ ), marked ( $M$ ) Chinook in month  $i$

$\hat{M}_{SUR_i}$  = estimated post-release mortality for sublegal ( $S$ ), unmarked ( $U$ ) Chinook in month  $i$

All class-specific ( $XY$  [ $X = L$  or  $S$ ,  $Y = M$  or  $U$ ]) release mortality estimates are obtained from:

$$(14) \quad \hat{M}_{XYR_i} = \hat{R}_{XY_i} * sfm_Y$$

$$(15) \quad \text{var}(\hat{M}_{XYR_i}) = \text{var}(\hat{R}_{XY_i}) * sfm_Y^2$$

Season-wide Total and Class-specific Mortality Estimation

$\hat{M}_{total}$  = total season-wide Chinook salmon mortality; this parameter and its variance [ $\text{var}(\hat{M}_{total})$ ] are computed as the sum of all monthly retention and release mortality estimates [i.e.,

$$\hat{M}_{total} = \sum_{i=1}^{\max i} (\hat{M}_{XYK_i} + \hat{M}_{XYR_i})]$$
 and variances

[ $\text{var}(\hat{M}_{total}) = \sum_{i=1}^{\max i} [\text{var}(\hat{M}_{XYK_i}) + \text{var}(\hat{M}_{XYR_i})]$ ], respectively, for all four size/mark-status groups ( $X = L$  or  $S$ ,  $Y = M$  or  $U$ ). Season total estimates for subgroups of interest (e.g., unmarked, sublegal Chinook,  $\hat{M}_{SU-total}$ ) are obtained by summing monthly estimates (and variances) across the season for just that group.

**D. Characterizing Precision of Estimates**

The precision of estimates generated from creel surveys and the preceding fishery impact estimation scheme is characterized using estimates of a parameter's standard error ( $SE$ ), coefficient of variation ( $CV$  or relative standard error), and approximate 95% confidence interval. For any parameter estimate  $\hat{\theta}$  (e.g.,  $\hat{M}_{total}$ ,  $\hat{K}_{LM_i}$ ,  $\hat{E}_i$ , etc.), these metrics are estimated using:

$$(16) \quad SE(\hat{\theta}) = \sqrt{\text{var}(\hat{\theta})}$$

$$(17) \quad CV(\hat{\theta}) = [SE(\hat{\theta}) / \hat{\theta}] * 100$$

$$(18) \quad CI = \hat{\theta} \pm 1.96 * SE(\hat{\theta})$$

**Figure A1.** (*On following page*) Graphical representation of the approach used to estimate monthly encounters and mortalities by size/mark-status category in mark-selective Chinook fisheries. Boxes depict abundance estimates (encounters, mortalities) whereas the mathematical operations depicted on intermediate connector lines are estimator formulae yielding quantities found in subsequent boxes (moving from left to right). Parameter definitions, complete formulae, and variances are defined in the preceding pages. For short-duration fisheries (~ 1 month or less), monthly and season-total values are equivalent; for all others, season-total impacts are equivalent to the sum of monthly impact estimates (and variances).

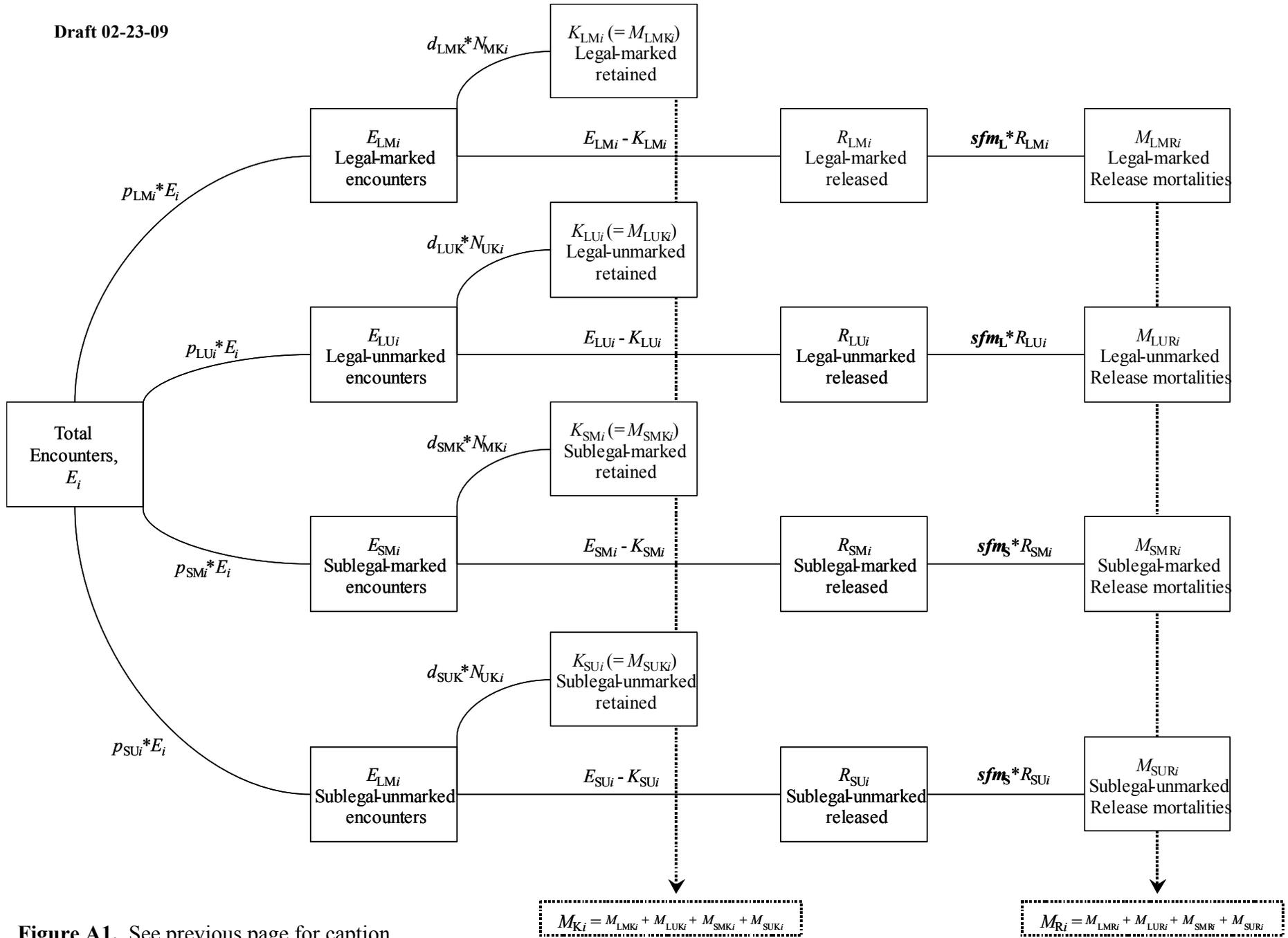


Figure A1. See previous page for caption.

**Appendix B1.** 2007 statistical weeks used by Washington Department of Fish and Wildlife.

2007 Statistical Week Calendar (Monday-Sunday)

STAT MONTH	WEEK NO.	START DATE	END DATE	STAT MONTH	WEEK NO.	START DATE	END DATE
1	1	1-Jan	7-Jan	7	27	2-Jul	8-Jul
	2	8-Jan	14-Jan		28	9-Jul	15-Jul
	3	15-Jan	21-Jan		29	16-Jul	22-Jul
	4	22-Jan	28-Jan		30	23-Jul	29-Jul
	5	29-Jan	4-Feb		31	30-Jul	5-Aug
2	6	5-Feb	11-Feb	8	32	6-Aug	12-Aug
	7	12-Feb	18-Feb		33	13-Aug	19-Aug
	8	19-Feb	25-Feb		34	20-Aug	26-Aug
	9	26-Feb	4-Mar		35	27-Aug	2-Sep
3	10	5-Mar	11-Mar	9	36	3-Sep	9-Sep
	11	12-Mar	18-Mar		37	10-Sep	16-Sep
	12	19-Mar	25-Mar		38	17-Sep	23-Sep
	13	26-Mar	1-Apr		39	24-Sep	30-Sep
4	14	2-Apr	8-Apr	10	40	1-Oct	7-Oct
	15	9-Apr	15-Apr		41	8-Oct	14-Oct
	16	16-Apr	22-Apr		42	15-Oct	21-Oct
	17	23-Apr	29-Apr		43	22-Oct	28-Oct
	18	30-Apr	6-May		44	29-Oct	4-Nov
5	19	7-May	13-May	11	45	5-Nov	11-Nov
	20	14-May	20-May		46	12-Nov	18-Nov
	21	21-May	27-May		47	19-Nov	25-Nov
	22	28-May	3-Jun		48	26-Nov	2-Dec
6	23	4-Jun	10-Jun	12	49	3-Dec	9-Dec
	24	11-Jun	17-Jun		50	10-Dec	16-Dec
	25	18-Jun	24-Jun		51	17-Dec	23-Dec
	26	25-Jun	1-Jul		52	24-Dec	30-Dec
					53	31-Dec	31-Dec

Appendix B2. 2008 statistical weeks used by Washington Department of Fish and Wildlife.

**WDFW STATISTICAL WEEKS 2008**

Stat Month	Week #	Start Date	End Date	Stat Month	Week #	Start Date	End Date
JAN 1	1	1-Jan	6-Jan	JUL 7	27	30-Jun	6-Jul
	2	7-Jan	13-Jan		28	7-Jul	13-Jul
	3	14-Jan	20-Jan		29	14-Jul	20-Jul
	4	21-Jan	27-Jan		30	21-Jul	27-Jul
	5	28-Jan	3-Feb		31	28-Jul	3-Aug
FEB 2	6	4-Feb	10-Feb	AUG 8	32	4-Aug	10-Aug
	7	11-Feb	17-Feb		33	11-Aug	17-Aug
	8	18-Feb	24-Feb		34	18-Aug	24-Aug
	9	25-Feb	2-Mar		35	25-Aug	31-Aug
MAR 3	10	3-Mar	9-Mar	SEP 9	36	1-Sep	7-Sep
	11	10-Mar	16-Mar		37	8-Sep	14-Sep
	12	17-Mar	23-Mar		38	15-Sep	21-Sep
	13	24-Mar	30-Mar		39	22-Sep	28-Sep
APR 4	14	31-Mar	6-Apr	OCT 10	40	29-Sep	5-Oct
	15	7-Apr	13-Apr		41	6-Oct	12-Oct
	16	14-Apr	20-Apr		42	13-Oct	19-Oct
	17	21-Apr	27-Apr		43	20-Oct	26-Oct
	18	28-Apr	4-May		44	27-Oct	2-Nov
MAY 5	19	5-May	11-May	NOV 11	45	3-Nov	9-Nov
	20	12-May	18-May		46	10-Nov	16-Nov
	21	19-May	25-May		47	17-Nov	23-Nov
	22	26-May	1-Jun		48	24-Nov	30-Nov
JUN 6	23	2-Jun	8-Jun	DEC 12	49	1-Dec	7-Dec
	24	9-Jun	15-Jun		50	8-Dec	14-Dec
	25	16-Jun	22-Jun		51	15-Dec	21-Dec
	26	23-Jun	29-Jun		52	22-Dec	28-Dec
						53	29-Dec

**Appendix C.** Monthly sample rates in the Area 10 (December 1, 2007 - January 31, 2008) selective Chinook fishery.

Time period			Estimated Retained Chinook				Number of Chinook sampled				Sample Rate (%)
Month	Stat. Week	Dates	Marked	Unmark	Unk.	Total	Marked	Unmark	Unk.	Total	
<b>December</b>	48-53	Dec 1 - Jan 1	412	21	0	433	82	3	0	85	19.6%
<b>January</b>	1-5	Jan 2 - Jan 31	212	0	0	212	55	0	0	55	25.9%
<b>Season Total</b>			<b>624</b>	<b>21</b>	<b>0</b>	<b>645</b>	<b>137</b>	<b>3</b>	<b>0</b>	<b>140</b>	<b>21.7%</b>

**Appendix D.** Murthy estimates of effort, retained catch, and releases in the Area 10 winter selective Chinook fishery, December 1, 2007 – January 31, 2008.

Stat Week	Est. Effort		Est. Retained Catch					Est. Releases					
	Boats	Anglers	Chinook				Chum	Chinook			Coho		Unk Salmon
			Mark	Unmark	UD	Total		Mark	Unmark	Unk.	AD	Unk	
48	96	200	31	0	0	31	15	76	11	62	15	38	0
49	254	466	107	0	0	107	22	212	113	93	0	0	4
50	170	258	70	9	0	79	0	51	60	55	0	0	45
51	171	308	91	12	0	103	0	181	67	87	0	0	0
52	267	519	113	0	0	113	23	133	62	241	0	0	0
53/1	19	30	2	0	0	2	0	13	6	8	0	0	0
2	107	224	42	0	0	42	0	102	41	105	0	0	0
3	152	270	98	0	0	98	0	70	32	117	0	0	17
4	126	259	70	0	0	70	0	104	7	57	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Summary Statistics for Area 10</b>													
<b>Total</b>	<b>1,360</b>	<b>2,534</b>	<b>624</b>	<b>21</b>	<b>0</b>	<b>645</b>	<b>60</b>	<b>942</b>	<b>400</b>	<b>826</b>	<b>15</b>	<b>38</b>	<b>66</b>
Variance	130	228	84	13		85	20	165	91	157	13	32	40
CV	28.30%	22.11%	29.87%	36.00%		30.02%	38.07%	18.57%	21.91%	18.26%	30.34%	19.32%	20.53%
95% CI	1,338-1,382	2,504-2,563	607-642	14-28		627-664	51-69	917-967	381-419	802-851	8-22	27-49	54-78

**Appendix E.** Summary of the total number of anglers intercepted in Area 10 during on-the-water surveys from December 1, 2007 through January 31, 2008. Grayed cells represent sites included in the dockside sample frame.

Site Name	Total Anglers (less 'Tengu' Armeni Ramp anglers)	Season Total (unadjusted) size measure	Total Anglers (with 'Tengu' Armeni Ramp anglers)	Season Total (unadjusted) size measure
Armeni Ramp	25	0.079	87	0.230
Bay Marina (Miller Bay)	2	0.006	2	0.005
Brownsville Ramp	21	0.066	21	0.056
Brownsville Marina	7	0.022	7	0.019
Des Moines Marina	12	0.038	12	0.032
Eagle Harbor Ramp	2	0.006	2	0.005
Edmonds Marina Dry Storage	28	0.089	28	0.074
Edmonds Sling	8	0.025	8	0.021
Edmonds Marina	10	0.032	10	0.026
Elliot Bay Marina	5	0.016	5	0.013
Everett Marina	5	0.016	5	0.013
Everett Ramp (Norton)	6	0.019	6	0.016
Harper Ramp	1	0.003	1	0.003
Kingston Public	35	0.111	35	0.093
Liberty Bay	2	0.006	2	0.005
Manchester	52	0.165	52	0.138
Miller Bay	2	0.006	2	0.005
Mukilteo Ramp	2	0.006	2	0.005
Narrows Marina	2	0.006	2	0.005
Point Defiance Ramp	2	0.006	2	0.005
Port Madison Marina	1	0.003	1	0.003
Port Orchard Marina	23	0.073	23	0.061
Port Orchard Ramp	4	0.013	4	0.011
Poulsbo Marina	1	0.003	1	0.003
Private Bouy/moorage	6	0.019	6	0.016
Redondo ramp	2	0.006	2	0.005
Shilshole Ramp	38	0.120	38	0.101
Shilshole Marina	8	0.025	8	0.021
Winslow Ramp	2	0.006	2	0.005
Yukon Harbor Ramp	2	0.006	2	0.005
<b>Total Anglers</b>	<b>316</b>	<b>1.000</b>	<b>378</b>	<b>1.000</b>

**Appendix F.** Size measures by sample date, for sites sampled during dockside creel surveys in the Area 10 mark-selective Chinook from December 1, 2007 through January 31, 2008.

SAMPLEDATE	WEEK	SITESIZE	SAMPLING SITE	SAMPLEDATE	WEEK	SITESIZE	SAMPLING SITE
12/1/2007	48	0.267	Armeni Ramp	1/3/2008	1	0.189	Armeni Ramp
12/1/2007	48	0.133	Shilshole Ramp	1/3/2008	1	0.340	Shilshole Ramp
12/2/2007	48	0.738	Armeni Ramp	1/4/2008	1	0.321	Manchester Ramp
12/2/2007	48	0.048	Shilshole Ramp	1/4/2008	1	0.340	Shilshole Ramp
12/5/2007	49	0.267	Armeni Ramp	1/5/2008	1	0.321	Manchester Ramp
12/5/2007	49	0.133	Shilshole Ramp	1/5/2008	1	0.340	Shilshole Ramp
12/6/2007	49	0.267	Armeni Ramp	1/6/2008	1	0.647	Armeni Ramp
12/6/2007	49	0.133	Shilshole Ramp	1/6/2008	1	0.137	Shilshole Ramp
12/7/2007	49	0.267	Armeni Ramp	1/7/2008	2	0.194	Armeni Ramp
12/7/2007	49	0.133	Shilshole Ramp	1/7/2008	2	0.347	Shilshole Ramp
12/8/2007	49	0.267	Armeni Ramp	1/10/2008	2	0.194	Armeni Ramp
12/8/2007	49	0.133	Shilshole Ramp	1/10/2008	2	0.347	Shilshole Ramp
12/9/2007	49	0.738	Armeni Ramp	1/11/2008	2	0.347	Shilshole Ramp
12/9/2007	49	0.048	Shilshole Ramp	1/11/2008	2	0.321	Kingston Ramp
12/11/2007	50	0.267	Armeni Ramp	1/12/2008	2	0.264	Manchester Ramp
12/11/2007	50	0.133	Shilshole Ramp	1/12/2008	2	0.347	Shilshole Ramp
12/12/2007	50	0.267	Armeni Ramp	1/13/2008	2	0.347	Shilshole Ramp
12/12/2007	50	0.133	Shilshole Ramp	1/13/2008	2	0.321	Kingston Ramp
12/14/2007	50	0.267	Armeni Ramp	1/15/2008	3	0.275	Shilshole Ramp
12/14/2007	50	0.133	Shilshole Ramp	1/15/2008	3	0.209	Edmonds Dry Storage
12/15/2007	50	0.267	Armeni Ramp	1/16/2008	3	0.275	Shilshole Ramp
12/15/2007	50	0.333	Kingston Ramp	1/16/2008	3	0.209	Edmonds Dry Storage
12/16/2007	50	0.738	Armeni Ramp	1/18/2008	3	0.209	Manchester Ramp
12/16/2007	50	0.048	Shilshole Ramp	1/18/2008	3	0.275	Shilshole Ramp
12/17/2007	51	0.280	Armeni Ramp	1/19/2008	3	0.154	Armeni Ramp
12/17/2007	51	0.240	Shilshole Ramp	1/19/2008	3	0.275	Shilshole Ramp
12/18/2007	51	0.280	Armeni Ramp	1/20/2008	3	0.209	Manchester Ramp
12/18/2007	51	0.240	Shilshole Ramp	1/20/2008	3	0.209	Edmonds Dry Storage
12/21/2007	51	0.280	Armeni Ramp	1/24/2008	4	0.148	Armeni Ramp
12/21/2007	51	0.320	Kingston Ramp	1/24/2008	4	0.225	Shilshole Ramp
12/22/2007	51	0.280	Armeni Ramp	1/25/2008	4	0.308	Manchester Ramp
12/22/2007	51	0.160	Manchester Ramp	1/25/2008	4	0.207	Kingston Ramp
12/23/2007	51	0.738	Armeni Ramp	1/26/2008	4	0.308	Manchester Ramp
12/23/2007	51	0.119	Kingston Ramp	1/26/2008	4	0.225	Shilshole Ramp
12/27/2007	52	0.280	Armeni Ramp	1/27/2008	4	0.225	Shilshole Ramp
12/27/2007	52	0.240	Shilshole Ramp	1/27/2008	4	0.207	Kingston Ramp
12/28/2007	52	0.280	Armeni Ramp	1/28/2008	5	0.148	Armeni Ramp
12/28/2007	52	0.320	Kingston Ramp	1/28/2008	5	0.225	Shilshole Ramp
12/29/2007	52	0.240	Shilshole Ramp	1/31/2008	5	0.148	Armeni Ramp
12/29/2007	52	0.320	Kingston Ramp	1/31/2008	5	0.225	Shilshole Ramp
12/30/2007	52	0.647	Armeni Ramp				
12/30/2007	52	0.049	Kingston Ramp				

**Appendix G.** Age composition of retained (dockside samples) and encountered (test fishery samples) Chinook salmon in the Area 10 mark-selective Chinook fishery, December 1, 2007 - January 31, 2008. Note that two test fishery Chinook of undetermined mark status were also aged (i.e., total  $n = 116$ ).

Source	Mark-status group	Age Composition								Total
		Month	1.1	2.1	2.2	3.1	3.2	4.1	4.2	
Dockside survey	AD	Dec	0	62	0	5	7	0	0	74
		Jan	0	0	0	50	0	3	0	53
		Total	0	62	0	55	7	3	0	127
			(0%)	(49%)	(0%)	(43%)	(6%)	(2%)	(0%)	(100%)
Test Fishery	AD	Dec	0	59	1	2	1	0	0	63
		Jan	0	1	0	29	0	1	1	32
		Total	0	60	1	31	1	1	1	95
			(0%)	(63%)	(1%)	(33%)	(1%)	(1%)	(1%)	(100%)
Test Fishery	UM	Dec	2	11	0	0	1	0	0	14
		Jan	0	0	0	5	0	0	0	5
		Total	2	11	0	5	1	0	0	19
			(11%)	(58%)	(0%)	(26%)	(5%)	(0%)	(0%)	(100%)

<sup>1/</sup> AD = Adipose fin-clipped (marked); UM = Adipose fin in tact (unmarked).

<sup>2/</sup> Gilbert-Rich age notation, "Total Age". "Age at outmigration", inclusive of time spent in incubation.

**Appendix H.** Coded-wire tag recoveries from Chinook salmon landed during the Area 10 winter 2007- 2008 mark-selective Chinook fishery from December 1, 2007 through January 31, 2008.

RecovDate	TagResult	TagCode	BroodYr	ReleaseSite	RearingHatchery	ReleaseAgency	DIT	FKLcm	RecovMark	ReleaseMark	Label
Dec 8 2007	Decoded Tag	632874	2004	SKOKOMISH R 16.0001	RICKS PD (LLTK)	WDFW		55	AD Fin Clp	AD Fin Clp	51102
Jan 19 2008	Decoded Tag	633369	2005	FRIDAY CR 03.0017	SAMISH HATCHERY	WDFW	DIT: 633368	54	AD Fin Clp	AD Fin Clp	51107
Dec 9 2007	Decoded Tag	633369	2005	FRIDAY CR 03.0017	SAMISH HATCHERY	WDFW	DIT: 633368	62	AD Fin Clp	AD Fin Clp	54673
Dec 18 2007	Decoded Tag	632889	2004	CASCADE R 03.1411	MARBLEMOUNT HATCHERY	WDFW	DIT: 632888	69	AD Fin Clp	AD Fin Clp	54807
Jan 19 2008	Decoded Tag	633366	2005	PURDY CR 16.0005	GEORGE ADAMS HATCHRY	WDFW	DIT: 633365	61	AD Fin Clp	AD Fin Clp	51108
Dec 23 2007	Decoded Tag	633285	2005	GROVERS CR 15.0299	GROVERS CR HATCHERY	SUQ	DIT: 210682	62	AD Fin Clp	AD Fin Clp	51106
Dec 22 2007	Decoded Tag	632880	2004	GORST CR 15.0216	GORST CR REARING PND	SUQ		62	AD Fin Clp	AD Fin Clp	54808
Dec 22 2007	Decoded Tag	210595	2004	WHITE R 10.0031	WHITE RIVER HATCHERY	MUCK		54	Unmarked	Unmarked	51105
Dec 21 2007	Decoded Tag	633285	2005	GROVERS CR 15.0299	GROVERS CR HATCHERY	SUQ	DIT: 210682	54	AD Fin Clp	AD Fin Clp	51104
Dec 21 2007	Decoded Tag	632879	2004	FINCH CR 16.0222	HOODSPORT HATCHERY	WDFW		62	AD Fin Clp	AD Fin Clp	51103
Jan 24 2008	Decoded Tag	632978	2004	CHAMBERS CR 12.0007	LAKEWOOD HATCHERY	WDFW		51	AD Fin Clp	AD Fin Clp	54809
Dec 18 2007	Decoded Tag	632786	2004	CHAMBERS CR 12.0007	CHAMBERS CR + GARRISON	WDFW		63	AD Fin Clp	AD Fin Clp	54806